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# FORTRAN IV ENHANCED CHARACTER GRAPHICS



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# COMPUTER SCIENCE & TECHNOLOGY:

## FORTRAN IV Enhanced Character Graphics

*Specified publication No. 500-32*

Norman M. Wolcott

Institute for Computer Sciences and Technology  
National Bureau of Standards  
Washington, D.C. 20234



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# FORTRAN IV ENHANCED CHARACTER GRAPHICS

N. M. Wolcott

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**ABSTRACT.** A FORTRAN IV subroutine is described which allows the drawing of six styles of alphabetic characters, three styles of numbers, and 48 special mathematical symbols from the enhanced graphic character set of Dr. A. V. Hershey. Twenty two symbols for graph plotting are also provided. Output is by linkage to an external subroutine PLOT. The program requires a computer which can accommodate a 30 bit word-length.

**Key words:** Alphabets; COM; computer graphics; computerized typesetting; digital plotting; plotting; type fonts; type setting; vectorized characters

**I. INTRODUCTION.** The enhanced graphic characters of Dr. A. V. Hershey (1), (2) are suitable for use on pen plotters or computer output microform devices using vector graphics. The subroutines presented here are an extension of those previously developed (3) to make the Hershey characters available with subroutines conforming as closely as possible to the American Standards Association FORTRAN IV Standard (4) so as to be useable on a variety of computers. The characters provided include the SIMPLEX ROMAN, SIMPLEX GREEK, DUPLEX ROMAN, COMPLEX ROMAN, COMPLEX GREEK, and COMPLEX ITALIC alphabets; SIMPLEX, COMPLEX, and DUPLEX numerals (as described in Refs (1) and (2)); and 48 special characters and mathematical symbols.

**II. COMPUTER ORGANIZATION.** The data to describe the characters and symbols are included in a BLOCK DATA subprogram of about a thousand cards. The data are in the form of decimal integers less than  $2^{**}30$  to accommodate a variety of computer word-lengths. The current 30 bit implementation allows the encoding of two (x,y) pen instructions per computer word. Each 15 bit pen instruction contains 3 bits of pen up or pen down information, 6 bits of x-coordinate information, and 6 bits of y-coordinate information. A zero instruction indicates the end of the character. In order to allow for textual input from various computers the input characters are limited to the 47 FORTRAN characters, that is A-Z, blank, 0-9, and + - / = ( ) \* , . \$. Eleven additional non-FORTRAN characters are used for control information; these characters may be varied by local option at each computer site.

Partial word accesses are provided for by means of an internal FORTRAN FUNCTION:

IFLD(N1,N2,WORD)

which retrieves bits N1 through N2 of WORD as an integer when the bits are numbered from the right (starting with 1).

Character (byte) access is provided by another internal function CHAR(J) which returns the J'th character of a textual string in the form of a binary integer. This function (which uses IFLD) will work on those computers which allow alphabetic characters to be manipulated as integers. This is the case with the IBM 360/370 and UNIVAC 1100 computers. For others the functions CHAR or IFLD may need to be rewritten.

The BLOCK DATA subprogram is written in an extension of FORTRAN IV which allows definition of arrays in DATA statements. This extension is compatible with most FORTRAN compilers.

All of the routines were run through the Pfort verifier (5), and no errors other than those of the FORTRAN extension were detected. To date the program has run successfully on the IBM 370, UNIVAC 1100, CDC 7600, and PDP-11 computers.

### III. DESCRIPTION OF THE PROGRAMS

#### SYMBOLTEST - MAIN PROGRAM

This is a main program which draws all of the alphabets and plots all of the plotting symbols available.

#### LENGTH(XLEN,HEIGHT,TEXT,N)

This subroutine returns in XLEN the length in inches of a textual string TEXT comprising N characters. This information is useful for centering and alignment.

#### STRIN(I,TEXT)

This integer function returns the I'th computer word of the textual string 'TEXT'. It is used only internally in SYMBOL.

#### SYMBOL(X,Y,HEIGHT,TEXT,THETA,N)

This subroutine draws graphic characters and plot symbols. When N is positive, N characters from the textual string TEXT are drawn. When N is negative, and TEXT is a binary integer between 0 and 21, a centered symbol from the set of 22 plotting symbols is plotted at (X,Y). When N is nought, a single simplex alphameric character (right justified in TEXT) is plotted at (X,Y). When X and/or Y = 999., the annotation is continued following the X and/or Y termination in the previous call to SYMBOL. The conventions for N<0 and N = 0 were designed to be compatible with local vendor supplied software. Minor modifications to the programs will accommodate other conventions.

## BLOCK DATA

The BLOCK DATA subprogram contains the data to draw the Hershey characters and the plotting symbols. Variables which need to be saved and the initialization of the computer character set are also included in this subprogram.

IV. OPERATION OF THE SUBROUTINE SYMBOL. The subroutine is accessed by a FORTRAN subroutine call:

```
CALL SYMBOL(X,Y,HEIGHT,TEXT,THETA,N)
```

For the case in which N>0 or N=0:

X,Y = coordinates of lower left hand corner of text  
HEIGHT = character height (capital letters) in inches  
TEXT = ALPHAMERIC textual array or Hollerith argument  
The data must be right justified in TEXT if a single character is desired and N=0.  
THETA = Angle (degrees) of inclination of TEXT to the horizontal  
N = Number of characters in textual array.  
If N=0 a single character right justified in TEXT is plotted.

For the case in which N<0:

X,Y = Coordinates of a centered symbol  
HEIGHT = Size of symbol in inches  
TEXT = Integer between 0 and 21 designating the desired symbol  
THETA = Angle (degrees) of inclination of TEXT to the horizontal  
N = Code indicating whether or not to draw a line through points:  
N=-1 A single centered symbol is plotted at (X,Y);  
N<-1 A line is drawn from current point to (X,Y), and a centered symbol is plotted.

The input string TEXT may contain the 47 FORTRAN characters for text and 11 non-FORTRAN characters which are used for control information. The control characters may be varied at implementation time by changing the associated data card in the BLOCK DATA subprogram. The current significance of the control characters is as follows:

1	\	Next character subscript
2	"	Next character superscript
3	@	Initiate upper case (default)
4	#	Initiate lower case
5	&	Initiate complex letters/numerals
6	^	Next character greek or math symbol
7	%	Initiate simplex letters (default)
8	?	Backspace (up to six backspaces allowed for)
9	!	Initiate italic letters/numerals
10	;	Initiate duplex letters/numerals
11	:	Terminate scan

Mathematical and special symbols are accessed by the control code !^. Since there are no italic greek characters this region of the table has been used to provide the 48 special characters and mathematical symbols. If no control information is provided in the input string, the default options of simplex upper case letters is supplied so that the program is 'downward compatible'. Up to six backspaces are allowed for in the program so that aligned subscripts and superscripts can be generated.

V. GRAPHICAL OUTPUT. The output of the test program is shown in Figs. 1 and 2. These figures show the range of characters and plotting symbols available. The program listings are in Appendix I. In Appendix II a special Fortran V version suitable for the UNIVAC 1100 is given.

For information on how to produce a desired character, reference should be made to the character repertory of Fig. 1. Each of the characters in the lines starting with numerics are produced by the corresponding FORTRAN character preceded by the appropriate control character(s) as shown to the right of the line. Characters in the lines beginning with alphabetic characters or mathematical and special symbols are produced by the control characters to the right of the line followed by the corresponding sequential alphabetic character. Thus for example the graphic sequence  $\Sigma \Theta$  is produced by the string argument to SYMBOL of '!^S^T', since S and T are the 19th and 20th letters of the alphabet and  $\Sigma$  and  $\Theta$  are the 19th and 20th graphics in the line governed by control code !^. Reference to the test program in Appendix I, which produced Figs. 1 and 2, will show in detail the calling sequence for the graphic and plotting symbols shown in the figures.

## VI. STEPS FOR IMPLEMENTATION.

(1) Install the appropriate version of the function IFLD at line SYM00800 of SYMBOL and at line TST00090 of the test program. Univac 1100 machines have one's complement arithmetic, while the IBM 360/370, and DEC PDP-10 and PDP-11 have two's complement arithmetic.

(2) Install the selected special characters at line DAT0830 of BLOCK DATA.

(3) Change the DATA statement at line DAT00840 of BLOCK DATA appropriate to the computer in use. (IOUT is the Fortran unit for line printer output.) NWORD and NCHAR are in general the number of bits per word and number of bits per character respectively.

(4) Provide a subroutine PLOT to generate plotter output for your plotting device.

The following versions of the program have been tested and are included to assist user implementation.

### UNIVAC 1100 FIELDATA FORTRAN

NWORD=36

NCHAR=6

IBM 360/370

NWORD=32

NCHAR=8

CDC 7600

NWORD=60

NCHAR=6

IFLD(NSTART,NBITS,IWORD)=AND SHIFT(MASK(NBITS),NBITS),  
2SHIFT(IWORD,NWORD-NSTART+NBITS))

## REFERENCES

- (1) A. V. Hershey, 'A Computer System for Scientific Typography', Computer Graphics and Image Processing, Vol.1., pp 373-385 (1972)
- (2) N. M. Wolcott and J. Hilsenrath, NBS Special Publication 424, "Tables of Coordinates for Hershey's Repertory of Occidental Type Fonts and Graphic Symbols". U. S. Govt. Printing Office, (1976)
- (3) N. M. Wolcott and F. L. McCrackin, Computer Graphics, Vol. 11, No.2, pp 121-127, (1977)
- (4) American Standards Association, 'American Standard Fortran', X3.9-1966, March, (1966)
- (5) B. G. Ryder and A. D. Hall, 'The PFORT Verifier', Bell Laboratories Computing Science Technical Report No. 12, July, (1975)

## DISCLAIMER

Certain commercial products and instruments are identified in this paper in order to specify adequately the experimental procedure. In no case does such identification imply recommendation or endorsement by the National Bureau of Standards, nor does it imply that the products or equipment identified are necessarily the best available for the purpose.

SIMPLE CHARACTERS	Control Codes
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Α Β Γ Δ Ε Ζ Η Θ Ι Κ Λ Μ Ν Ξ Ο Π Ρ Σ Τ Υ Φ Χ Ψ Ω a b c d e f g h i j k l m n o p q r s t u v w x y z α β γ δ ε ξ η ϑ ι κ λ μ ν ξ ο π ρ σ τ υ φ χ ψ ω 0 1 2 3 4 5 6 7 8 9 + - / = ( ) * , . \$	none or @ none or @ ^ # #^ none or @

BOLD CHARACTERS	&
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	&
Α Β Γ Δ Ε Ζ Η Θ Ι Κ Λ Μ Ν Ε Ο Π Ρ Σ Τ Υ Φ Χ Ψ Ω	&^
a b c d e f g h i j k l m n o p q r s t u v w x y z	&#
α β γ δ ε ξ η υ ι κ λ μ ν ξ ο π ρ σ τ υ φ χ ψ ω	&#^
0 1 2 3 4 5 6 7 8 9 + - / = ( ) * , . \$	&
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	!
a b c d e f g h i j k l m n o p q r s t u v w x y z	!#
< > ∂ ∇ ε ≤ ≥ α ∫ φ ∞ ± ∏ × ÷ ∑ θ { } @ ρ	!^
[ ] # § † ; ! ? % & ; ! ? ~ ⟨ ⟩   x ° → φ ‡	!#^
0 1 2 3 4 5 6 7 8 9 + - / = ( ) * , . \$	!
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	:
a b c d e f g h i j k l m n o p q r s t u v w x y z	:
0 1 2 3 4 5 6 7 8 9 + - / = ( ) * , . \$	:

VERTICAL

INDEXICALS  $\pi r^2$   $a_{12}$   
 $A^{12}_{34}$   $B^{1234}_{56}$

Fig. 1 CHARACTER REPERTORY

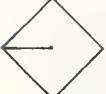
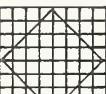
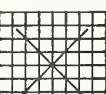
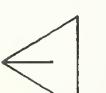
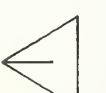
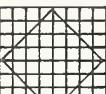
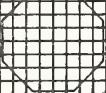
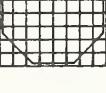
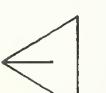
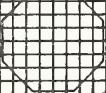
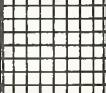
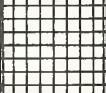
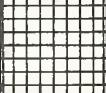
					
					
					
					
					

Fig. 2 SYMBOL REPERTORY

APPENDIX I. PROGRAM LISTINGS

```

C MAIN PROGRAM TO TEST THE SYMBOL ROUTINE TST00010
C ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789+-/*(), . $ TST00020
C DIMENSION BUFFER(1000) TST00030
C DIMENSION JJ(1) TST00040
C DIMENSION OLDX(6),OLDY(6),IA(256),IB(58) TST00050
C COMMON /SAVE/ XL,OLDX,OLDY,IA,IB,NWORD,NCHAR,NCWD,IOUT,FIRST,LNGHT TST00060
C LOGICAL FIRST,LNGTH TST00070
C IFLD GETS N BITS STARTING AT NSTART TH BIT FROM RIGHT TST00080
C IFLD(NSTART,NBITS,IWORD)=MOD(IWORD/(2**((NSTART-NBITS)),2**NBITS)+(TST00090
C 2*(1-ISIGN(1,+IWORD))/2)*(2**NBITS-1) TST00100
C ***USE ABOVE CARD IF YOUR MACHINE HAS ONES COMPLEMENT ARITHMETIC TST00110
C 2*(1-ISIGN(1,IWORD))/2)*(2**NBITS-MIN0(1, TST00120
C 3MOD(-IWORD,2**((NSTART-NBITS)))) TST00130
C ***USE ABOVE CARD IF YOUR MACHINE HAS TWOS COMPLEMENT ARITHMETIC TST00140
C CALL PLOTS (BUFFER,1000,9) TST00150
C CALL LENGTH (XST,.2,18HSIMPLE CHARACTERS:,50) TST00160
C XST=2.5-XST/2. TST00170
C CALL SYMBOL (XST,10.5,0.2,18HSIMPLE CHARACTERS:,0.,23) TST00180
C CALL SYMBOL (0.,10.0,0.2,26HABCDEFGHIJKLMNOPQRSTUVWXYZ,0.,26) TST00190
C CALL SYMBOL (0.,9.7,.2,48H^A^B^C^D^E^F^G^H^I^J^K^L^M^N^O^P^Q^R^S^TT TST00200
C 2^U^V^W^X,0.,48) TST00210
C CALL SYMBOL (0.,9.4,0.2,27H#ABCDEFGHIJKLMNOPQRSTUVWXYZ,0.,27) TST00220
C CALL SYMBOL (0.,9.1,.2,49H#^A^B^C^D^E^F^G^H^I^J^K^L^M^N^O^P^Q^R^S^TT TST00230
C 2T^U^V^W^X,0.,49) TST00240
C CALL SYMBOL (0.,8.8,0.2,20H0123456789+-/=(*)*, .$,0.,20) TST00250
C CALL LENGTH (XST,.2,17H&BOLD CHARACTERS:,25) TST00260
C XST=2.5-XST/2. TST00270
C CALL SYMBOL (XST,8.0,0.2,17H&BOLD CHARACTERS:,0.,22) TST00280
C CALL SYMBOL (0.,7.5,0.2,27H&ABCDEFGHIJKLMNOPQRSTUVWXYZ,0.,27) TST00290
C CALL SYMBOL (0.,7.2,.2,49H&^A^B^C^D^E^F^G^H^I^J^K^L^M^N^O^P^Q^R^S^TT TST00300
C 2T^U^V^W^X,0.,49) TST00310
C CALL SYMBOL (0.,6.9,0.2,28H#ABCDEFGHIJKLMNOPQRSTUVWXYZ,0.,28) TST00320
C CALL SYMBOL (0.,6.6,.2,50H#^A^B^C^D^E^F^G^H^I^J^K^L^M^N^O^P^Q^R^S^TT TST00330
C 2T^U^V^W^X,0.,50) TST00340
C CALL SYMBOL (0.,6.3,0.2,21H&0123456789+-/=(*)*, .$,0.,21) TST00350
C CALL SYMBOL (0.,6.0,0.2,28H!@ABCDEFGHIJKLMNOPQRSTUVWXYZ,0.,28) TST00360
C CALL SYMBOL (0.,5.7,0.2,28H#!ABCDEFGHIJKLMNOPQRSTUVWXYZ,0.,28) TST00370
C CALL SYMBOL (0.,5.4,.2,49H!^A^B^C^D^E^F^G^H^I^J^K^L^M^N^O^P^Q^R^S^TT TST00380
C 2T^U^V^W^X,0.,49) TST00390
C CALL SYMBOL (0.,5.1,.2,50H#!^A^B^C^D^E^F^G^H^I^J^K^L^M^N^O^P^Q^R^S^TT TST00400
C 2T^U^V^W^X,0.,50) TST00410
C CALL SYMBOL (0.,4.8,.2,21H!0123456789+-/=(*)*, .$,0.,21) TST00420
C CALL SYMBOL (0.,4.5,0.2,28H;@ABCDEFGHIJKLMNOPQRSTUVWXYZ,0.,28) TST00430
C CALL SYMBOL (0.,4.2,0.2,28H;#ABCDEFGHIJKLMNOPQRSTUVWXYZ,0.,28) TST00440
C CALL SYMBOL (0.,3.9,.2,21H;0123456789+-/=(*)*, .$,0.,21) TST00450
C CALL SYMBOL (1.,1.,.21,8HVERTICAL,90.,8) TST00460
C CALL SYMBOL (2.,2.,.21,28HINDEXICALS #^PR"2 &#A\1\2,0.,28) TST00470
C CALL SYMBOL (2.,1.6,.21,28H@A"1"2??\3\4 B"1"2"3"4??\5\6,0.,28) TST00480
C CALL PLOT (10.,0.,-3) TST00490
C XMARG=1. TST00500
C YMARG=9. TST00510
C STEP=.1 TST00520
C XINC=1. TST00530
C DO 50 J=1,4 TST00540
C DO 40 I=1,6 TST00550
C JJ(1)=I+(J-1)*6-1 TST00560
C XX=XMARG-4.*STEP TST00570
C YY=YMARG-4.*STEP TST00580
C XXX=XX TST00590
C YYY=YY TST00600

```

```

DO 10 II=1,9          TST00610
CALL PLOT (XXX,YYY,3) TST00620
CALL PLOT (XXX+.8,YYY,2) TST00630
10   YYY=YYY+STEP      TST00640
    XXX=XX             TST00650
    YYY=YY             TST00660
    DO 20 II=1,9        TST00670
    CALL PLOT (XXX,YYY,3) TST00680
    CALL PLOT (XXX,YYY+.8,2) TST00690
20'  XXX=XXX+STEP      TST00700
    DO 30 K=1,2         TST00710
    IF (JJ(1).LE.22) CALL SYMBOL (XMARG, YMARG,.8,JJ,0.,-1)
    IF (JJ.GT.14) CALL SYMBOL(XX,YY,.8,JJ,0.,-1) TST00720
30   XMARG=XMARG+XINC TST00730
40   CONTINUE           TST00740
    YMARG=YMARG-2.      TST00750
    XMARG=1.             TST00760
50   CONTINUE           TST00770
    DO 60 I=1,22        TST00780
    JJ(1)=I-1           TST00790
    CALL SYMBOL (XMARG, YMARG,.15,JJ,0.,0) TST00800
    JJ(1)=IFLD(NWORD,NCHAR,IB(I+20)) TST00810
    CALL SYMBOL (XMARG, YMARG+.5,.15,JJ,0.,0) TST00820
60   XMARG=XMARG+.5    TST00830
    XMARG=1.             TST00840
    YMARG=.5             TST00850
    CALL PLOT (XMARG, YMARG,3) TST00860
    DO 70 I=1,22        TST00870
    JJ(1)=I-1           TST00880
70   CALL SYMBOL (XMARG, YMARG,.15,JJ,0.,-2) TST00890
    XMARG=XMARG+.5    TST00900
    CALL PLOT (0.,0.,999) TST00910
    STOP                TST00920
    END                 TST00930
                                TST00940

```

SUBROUTINE SYMBOL (X,Y,HEIGHT,TEXT,THETA,N) SYM00010  
 \*\*\*\* SYM00020  
 \*\*\*\* SYM00030  
 \*\*\*\* SYM00040  
 C FORTRAN IV(MOSTLY) VERSION 3.0 AUGUST 1977 SYM00050  
 PROBLEMS ETCETERA CONTACT N.WOLCOTT, NBS, 301-921-3384 SYM00060  
 C \*\*\*\* SYM00070  
 C \*\*\*\* SYM00080  
 C \*\*\*\* SYM00090  
 C SIMILAR TO ROUTINE SYMBOL USED IN PEN PLOTTERS SYM00100  
 C INSTRUCTIONS FOR DRAWING CHARACTERS ARE IN ALFBET STORED SYM00110  
 C TWO INSTRUCTIONS PER WORD. A ZERO FOR PEN POSITION INDICATES SYM00120  
 C END OF A CHARACTER. INPUT TEXTUAL STRINGS MUST BE COMPOSED OF ONLY SYM00130  
 C THE FORTRAN CHARACTERS A-Z 0-9+-/=()\*,.,\$ AND THE NON-FORTRAN SYM00140  
 C SPECIAL CHARACTERS WHICH ARE DESCRIBED BELOW. SYM00150  
 C X,Y = (X,Y) COORDINATE OF LOWER LEFT HAND CORNER OF TEXT SYM00160  
 C HEIGHT = HEIGHTH (IN INCHES) OF UPPER CASE CHARACTERS SYM00170  
 C TEXT = INPUT TEXTUAL ARRAY OR HOLLERITH STRING SYM00180  
 C THETA = ANGLE IN DEGREES OF TEXT FROM X-AXIS SYM00190  
 C N = NUMBER OF CHARACTERS IN TEXT STRING SYM00200  
 C SYM00210  
 C IF N IS NEGATIVE AND TEXT IS A BINARY INTEGER BETWEEN SYM00220  
 1 AND 21 A CENTERED SYMBOL FROM THE SYMBOL SET IS PRODUCED SYM00230  
 AT (X,Y). SYM00240  
 C IF N IS 0 A SINGLE SIMPLEX ALPHANUMERIC FORTRAN CHARACTER SYM00250  
 (RIGHT JUSTIFIED IN TEXT) IS PRODUCED AT (X,Y). SYM00260  
 C IF X AND/OR Y EQUAL 999. THE ANNOTATION WILL BE CONTINUED SYM00270  
 AFTER THE PREVIOUS X AND/OR Y TERMINATION. SYM00280  
 C SYM00290  
 C ISTART(I) CONTAINS THE INDEX INTO ALFBET OF THE FIRST INSTRUCTION SYM00300  
 C OF CHARCTER NUMBER I WHOSE WIDTH IS STORED IN WIDTH(I) SYM00310  
 C CHARACTERS 1 TO 26 ARE ROMAN SIMPLEX UPPER CASE SYM00320  
 C CHARACTERS 27 TO 50 ARE GREEK SIMPLEX UPPER CASE SYM00330  
 C CHARACTERS 51 TO 76 ARE ROMAN SIMPLEX LOWER CASE SYM00340  
 C CHARACTERS 77 TO 100 ARE GREEK SIMPLEX LOWER CASE SYM00350  
 C CHARACTERS 101 TO 126 ARE ROMAN COMPLEX UPPER CASE SYM00360  
 C CHARACTERS 127 TO 150 ARE GREEK COMPLEX UPPER CASE SYM00370  
 C CHARACTERS 151 TO 176 ARE ROMAN COMPLEX LOWER CASE SYM00380  
 C CHARACTERS 177 TO 200 ARE GREEK COMPLEX LOWER CASE SYM00390  
 C CHARACTERS 201 TO 226 ARE ITALIC UPPER CASE SYM00400  
 C CHARACTERS 227 TO 250 ARE MATHEMATICAL AND SPECIAL SYMBOLS SYM00410  
 C CHARACTERS 251 TO 276 ARE ITALIC LOWER CASE SYM00420  
 C CHARACTERS 277 TO 300 ARE MATHEMATICAL AND SPECIAL SYMBOLS SYM00430  
 C CHARACTERS 301 TO 320 ARE SIMPLEX DIGITS AND SPECIAL SYMBOLS SYM00440  
 C CHARACTERS 321 TO 340 ARE COMPLEX DIGITS AND SPECIAL SYMBOLS SYM00450  
 C CHARACTERS 341 TO 360 ARE ITALIC DIGITS AND SPECIAL SYMBOLS SYM00460  
 C CHARACTERS 361 TO 380 ARE DUPLEX DIGITS AND SPECIAL SYMBOLS SYM00470  
 C CHARACTERS 381 TO 432 ARE DUPLEX UPPER AND LOWER CASE SYM00480  
 C ISPEC(11) ARE ELEVEN SPECIAL CHARACTERS CHOSEN FROM THE NON- SYM00490  
 FORTRAN SET AT YOUR SITE. CURRENT IMPLEMENTATIONS FOLLOW SYM00500  
 SP11 MAY BE SET TO THE COMPUTER STOP CODE IF ONE EXISTS. SYM00510  
 C SP1 \ NEXT CHARACTER SUBSCRIPT SYM00520  
 C SP2 " NEXT CHARACTER SUPERSCRIPT SYM00530  
 C SP3 @ TURN ON UPPER CASE SYM00540  
 C SP4 # TURN ON LOWER CASE SYM00550  
 C SP5 & TURN ON COMPLEX LETTERS SYM00560  
 C SP6 ^ NEXT CHARACTER GREEK LETTER OR MATH SYMBOL SYM00570  
 C SP7 % TURN ON SIMPLEX LETTERS SYM00580  
 C SP8 ? BACK SPACE LAST CHARACTER SYM00590  
 C SP9 ! ITALIC LETTERS SYM00600  
 C SP10 ; DUPLEX LETTERS SYM00610  
 C SP11 : TERMINATE SCAN SYM00620  
 C SYM00630

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C ****SYM00640
C ****SYM00650
DIMENSION TEXT(1),IFORT(47),IA(256),IB(58),ISPEC(11) SYM00660
DIMENSION ALFBET(4711),WIDTH(432),ISTART(432),ISYMB0(128) SYM00670
DIMENSION JSTSYM(22) SYM00680
DIMENSION OLDX(6),OLDY(6) SYM00690
COMMON /IALPH/ WIDTH,ALFBET,ISTART,ISYMB0,JSTSYM SYM00700
COMMON /SAVE/ XL,OLDX,OLDY,IA,IB,NWORD,NCHAR,NCWD,IOUT,FIRST,LNGTHSYM00710
LOGICAL FIRST,LNGTH SYM00720
INTEGER STRIN,CHAR,TEXT,ALFBET,ISTART SYM00730
EQUIVALENCE (IB(1),IFORT(1)), (IB(48),ISPEC(1)) SYM00740
C RX=CX-SY SYM00750
C RY=SX+CY SYM00760
C RX(X,Y)=RY(-Y,X) SYM00770
C RY(X,Y)=RX(Y,-X) SYM00780
C IFLD GETS N BITS STARTING AT NSTART TH BIT FROM RIGHT SYM00790
IFLD(NSTART,NBITS,IWORD)=MOD(IWORD/(2**((NSTART-NBITS))),2**NBITS)+(SYM00800
2(1-ISIGN(1,+IWORD))/2)*(2**NBITS-1) SYM00810
C ***USE ABOVE CARD IF YOUR MACHINE HAS ONES COMPLEMENT ARITHMETIC SYM00820
C 2 (1-ISIGN(1,IWORD))/2)*(2**NBITS-MIN0(1, SYM00830
C 3MOD(-IWORD,2**((NSTART-NBITS)))) SYM00840
C ***USE ABOVE CARD IF YOUR MACHINE HAS TWOS COMPLEMENT ARITHMETIC SYM00850
C CHAR(J) GETS THE J TH CHARACTER OF NCHAR BITS FROM A STRING SYM00860
C COMPOSED OF WORDS NWORD BITS LONG. SYM00870
CHAR(J)=IFLD((NWORD-MOD((J-1),NCWD)*NCHAR),NCHAR,STRIN((J+NCWD-1)/SYM00880
2NCWD,TEXT)) SYM00890
R(XX,YY)=CO*XX-SI*YY SYM00900
IF (.NOT.FIRST) GO TO 20 SYM00910
NCWD=NWORD/NCHAR SYM00920
DO 10 I=1,58 SYM00930
LL=IFLD(NWORD,NCHAR,IB(I)) SYM00940
IA(LL+1)=I SYM00950
10 CONTINUE SYM00960
FIRST=.FALSE. SYM00970
THE=THETA*355./(180.*113.) SYM00980
SI=SIN(THE) SYM00990
CO=COS(THE) SYM01000
SCALE=HEIGHT/21. SYM01010
C OFFSET OF 11 UNITS SYM01020
X1=X SYM01030
Y1=Y SYM01040
IF (X1.GT.998.5) X1=OLDX(6) SYM01050
IF (Y1.GT.998.5) Y1=OLDY(6) SYM01060
NN=N SYM01070
IF (NN) 50,30,120 SYM01080
30 ICHR=NCWD-1 SYM01090
IG=CHAR(ICHRS+1) SYM01100
IC=IA(IG+1) SYM01110
IF (IC.LE.47) GO TO 40 SYM01120
GO TO 440 SYM01130
40 NN=1 SYM01140
GO TO 140 SYM01150
50 IF (N.EQ.-1) GO TO 60 SYM01160
CALL PLOT (X1,Y1,2) SYM01170
60 IG=TEXT(1)+1 SYM01180
IF (IG.LE.22) GO TO 70 SYM01190
GO TO 440 SYM01200
70 I6=JSTSYM(IG) SYM01210
I5=30 SYM01220
80 I8=IFLD(I5,3,ISYMB0(I6)) SYM01230
C GO TO CENTER OF SYMBOL SYM01240
IF (I8) 100,90,100 SYM01250
90 CALL PLOT (X1,Y1,3) SYM01260

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	X1=X1+20.	SYM01270
	Y1=Y1+20.	SYM01280
	GO TO 440	SYM01290
100	IX=IFLD(I5-3,6,ISYMBO(I6))	SYM01300
	IY=IFLD(I5-9,6,ISYMBO(I6))	SYM01310
	XI=SCALE*(FLOAT(IX-32))	SYM01320
	YI=SCALE*(FLOAT(IY-32))	SYM01330
	CALL PLOT (X1+R(XI,YI),Y1+R(YI,-XI),I8)	SYM01340
	I5=45-I5	SYM01350
	IF (I5.EQ.30) I6=I6+1	SYM01360
	GO TO 80	SYM01370
120	DO 130 I=1,6	SYM01380
	OLDX(I)=X	SYM01390
130	OLDY(I)=Y	SYM01400
	ICHR=0	SYM01410
C	CHARACTER	SYM01420
140	IC=0	SYM01430
C	SIMPLEX CAPITAL LETTERS	SYM01440
	IP=0	SYM01450
	ICAP=0	SYM01460
	ICOMP=0	SYM01470
	ITALIC=0	SYM01480
	IDUPLE=0	SYM01490
C	NOT GREEK LETTERS	SYM01500
	IGREEK=0	SYM01510
C	PRINT SYMBOL ON LINE (NOT SUBSCRIPT OR SUPERSCRIPT)	SYM01520
	L=1	SYM01530
	SCALE=HEIGHT/21.	SYM01540
	DO 430 I1=1,NN	SYM01550
C	EXTRACT CHARACTER FROM TEXT	SYM01560
	ICHR=ICHR+1	SYM01570
	IG=CHAR(ICHR)	SYM01580
	IC=IA(IG+1)	SYM01590
	IF (ICHR.GT.NN.AND.N.GT.0) GO TO 450	SYM01600
	IF (IC.LE.58) GO TO 160	SYM01610
	WRITE (IOUT,150) IG	SYM01620
150	FORMAT (1X,19HILLEGAL INPUT CHAR ,I12)	SYM01630
	GO TO 430	SYM01640
160	IP=ICOMP+ICAP+ITALIC+IDUPLE	SYM01650
	IF (IC-27) 170,410,270	SYM01660
C	NUMBER OF SYMBOL	SYM01670
170	IC=IC+IP+IGREEK-ICAP*IDUPLE*24/(50*380)	SYM01680
180	I6=ISTART(IC)	SYM01690
	I5=30	SYM01700
	IF (LNGTH) GO TO 250	SYM01710
C	PRINT ALPHABETICAL CHARACTER	SYM01720
190	I8=IFLD(I5,3,ALFBET(I6))	SYM01730
C	TEST FOR END OF CHARACTER,I8=0	SYM01740
	IF (I8.EQ.0) GO TO 240	SYM01750
	IX=IFLD(I5-3,6,ALFBET(I6))	SYM01760
	IY=IFLD(I5-9,6,ALFBET(I6))	SYM01770
C	IF L=1, PRINT SYMBOL ON LINE, IF L=2, SUBSCRIPT, IF L=3, SUPERSCRIPT	SYM01780
	GO TO (200,210,220), L	SYM01790
200	RSCALE=SCALE	SYM01800
	YOFF=0.	SYM01810
	GO TO 230	SYM01820
C	SUBSCRIPT	SYM01830
210	RSCALE=SCALE*0.5	SYM01840
	YOFF=-HEIGHT/4.	SYM01850
	GO TO 230	SYM01860
C	SUPERSCRIPT	SYM01870
220	RSCALE=SCALE*0.5	SYM01880
	YOFF=HEIGHT*3./4.	SYM01890

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C ABOVE FACTORS NEEDED TO CORRECT OFFSET FOR DIFFERENT SIZE LETTERS SYM01900
230 YI=FLOAT(IY-11)*RSCALE+YOFF SYM01910
    XI=FLOAT(IX-10)*RSCALE SYM01920
    CALL PLOT (X1+R(XI,YI),Y1+R(YI,-XI),I8) SYM01930
    I5=45-I5 SYM01940
    IF (I5.EQ.30) I6=I6+1 SYM01950
    GO TO 190 SYM01960
240 IGREEK=0 SYM01970
250 X1=X1+R(WIDTH(IC)*RSCALE,0.0) SYM01980
    Y1=Y1+R(0.,-WIDTH(IC)*RSCALE) SYM01990
    DO 260 I=1,5 SYM02000
    OLDX(I)=OLDX(I+1) SYM02010
260 OLDY(I)=OLDY(I+1) SYM02020
    OLDX(6)=X1 SYM02030
    OLDY(6)=Y1 SYM02040
    RSCALE=SCALE SYM02050
    L=1 SYM02060
    GO TO 430 SYM02070
270 IF (IC.GT.47) GO TO 280 SYM02080
    IC=IC+273 SYM02090
    IF (ICOMP.NE.0) IC=IC+20 SYM02100
    IF (ITALIC.NE.0) IC=IC+40 SYM02110
    IF (IDUPLE.NE.0) IC=IC+60 SYM02120
    GO TO 180 SYM02130
280 L1=IC-47 SYM02140
    GO TO (290,300,310,320,330, 340,350,360,380,390, 400), L1 SYM02150
C SUBSCRIPT SYM02160
290 L=2 SYM02170
    GO TO 430 SYM02180
C SUPERSCRIPT SYM02190
300 L=3 SYM02200
    GO TO 430 SYM02210
C UPPER CASE SYM02220
310 ICAP=0 SYM02230
    GO TO 430 SYM02240
C LOWER CASE SYM02250
320 ICAP=50 SYM02260
    GO TO 430 SYM02270
C COMPLEX LETTERS SYM02280
330 ICOMP=100 SYM02290
    ITALIC=0 SYM02300
    IDUPLE=0 SYM02310
    GO TO 430 SYM02320
C GREEK LETTERS SYM02330
340 IGREEK=26 SYM02340
    IF (IDUPLE.NE.0) IGREEK=0 SYM02350
    GO TO 430 SYM02360
C SIMPLEX LETTERS SYM02370
350 ICOMP=0 SYM02380
    ITALIC=0 SYM02390
    IDUPLE=0 SYM02400
    GO TO 430 SYM02410
C BACKSPACE SYM02420
360 DO 370 I=1,5 SYM02430
    IK=6-I SYM02440
    OLDX(IK+1)=OLDX(IK) SYM02450
370 OLDY(IK+1)=OLDY(IK) SYM02460
    X1=OLDX(6) SYM02470
    Y1=OLDY(6) SYM02480
    GO TO 430 SYM02490
C ITALIC SYM02500
380 ITALIC=200 SYM02510
    ICOMP=0 SYM02520

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	IDUPLE=0	SYM02530
C	GO TO 430	SYM02540
	DUPLEX	SYM02550
390	IDUPLE=380	SYM02560
	ICOMP=0	SYM02570
	ITALIC=0	SYM02580
	GO TO 430	SYM02590
C	END OF SCAN	SYM02600
400	GO TO 450	SYM02610
C	BLANK SPACE	SYM02620
410	X1=X1+R(20.*RSCALE,0.)	SYM02630
	Y1=Y1+R(0.,-20.*RSCALE)	SYM02640
	DO 420 I=1,5	SYM02650
	OLDX(I)=OLDX(I+1)	SYM02660
420	OLDY(I)=OLDY(I+1)	SYM02670
	OLDX(6)=X1	SYM02680
	OLDY(6)=Y1	SYM02690
	L=1	SYM02700
430	CONTINUE	SYM02710
440	CONTINUE	SYM02720
	IF(LNGTH) GO TO 450	SYM02730
	OLDX(6)=X1	SYM02740
	OLDY(6)=Y1	SYM02750
450	IF (LNGTH) XL=SQRT((X1-X)**2+(Y1-Y)**2)	SYM02760
	RETURN	SYM02770
	END	SYM02780

```

C
C
C
SUBROUTINE LENGTH (XLEN,HEIGHT,TEXT,N)          LEN00010
*****                                                 LEN00020
*****                                                 LEN00030
*****                                                 LEN00040
*****                                                 LEN00050
LENGTH OF TEXT IS RETURNED IN XLEN               LEN00060
DIMENSION TEXT(1),IA(256),IB(58),OLDX(6),OLDY(6) LEN00070
COMMON /SAVE/ XL,OLDX,OLDY,IA,IB,NWORD,NCHAR,NCWD,IOUT,FIRST,LNGTHLEN00080
LOGICAL LNGTH,FIRST                            LEN00090
INTEGER TEXT                                     LEN00100
LNGTH=.TRUE.                                     LEN00110
CALL SYMBOL (0.,0.,HEIGHT,TEXT,0.,N)             LEN00120
XLEN=XL                                         LEN00130
RETURN                                           LEN00140
END                                              LEN00150
INTEGER FUNCTION STRIN(I,TEXT)                  STR00010
*****                                                 STR00020
*****                                                 STR00030
*****                                                 STR00040
DIMENSION TEXT(1)                                STR00050
INTEGER TEXT                                     STR00060
STRIN=TEXT(I)                                    STR00070
RETURN                                           STR00080
END                                              STR00090

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BLOCK DATA

DAT00010  
DAT00020  
\*\*\*\*\* DAT00030  
DIMENSION ISY110(60),ISY111(60),ISY112(8),JSTS(22),ISYMB0(128) DAT00050  
DIMENSION IAL110(60),IAL111(60),IAL112(60),IAL113(60),IAL114(60), DAT00060  
2 IAL115(60),IAL116(60),IAL117(60),IAL118(60),IAL119(60),IAL120(60) DAT00070  
3, IAL121(60),IAL122(60),IAL123(60),IAL124(60),IAL125(60),IAL126(60) DAT00080  
4, IAL127(60),IAL128(60) DAT00090  
DIMENSION IAL129(60),IAL130(60),IAL131(60),IAL132(60),IAL133(60), DAT00100  
2 IAL134(60),IAL135(60),IAL136(60),IAL137(60),IAL138(60),IAL139(60) DAT00110  
3, IAL140(60),IAL141(60),IAL142(60),IAL143(60),IAL144(60),IAL145(60) DAT00120  
4, IAL146(60),IAL147(60) DAT00130  
DIMENSION IAL148(60),IAL149(60),IAL150(60),IAL151(60),IAL152(60), DAT00140  
2 IAL153(60),IAL154(60),IAL155(60),IAL156(60),IAL157(60),IAL158(60) DAT00150  
3, IAL159(60),IAL160(60),IAL161(60),IAL162(60),IAL163(60),IAL164(60) DAT00160  
4, IAL165(60),IAL166(60) DAT00170  
DIMENSION IAL167(60),IAL168(60),IAL169(60),IAL170(60),IAL171(60), DAT00180  
2 IAL172(60),IAL173(60),IAL174(60),IAL175(60),IAL176(60),IAL177(60) DAT00190  
3, IAL178(60),IAL179(60),IAL180(60),IAL181(60),IAL182(60),IAL183(60) DAT00200  
4, IAL184(60),IAL185(60) DAT00210  
DIMENSION IAL186(60),IAL187(60),IAL188(31),WID110(100),WID111(100) DAT00220  
2, WID112(100),WID113(100),WID114(32),IST110(100),IST111(100), DAT00230  
3 IST112(100),IST113(100),IST114(32) DAT00240  
DIMENSION IFORT(47),IA(256),IB(58),ISPEC(11),OLDX(6),OLDY(6) DAT00250  
DIMENSION IALFBE(4711),WIDTH(432),ISTART(432) DAT00260  
COMMON /IALPH/ WIDTH,IALFBE,ISTART,ISYMB0,JSTS(DAT00270  
COMMON /SAVE/ XL,OLDX,OLDY,IA,IB,NWORD,NCHAR,NCWD,IOUT,FIRST,LNGTH(DAT00280  
LOGICAL FIRST,LNGTH DAT00290  
EQUIVALENCE (IB(1),IFORT(1)), (IB(48),ISPEC(1)) DAT00300  
EQUIVALENCE (IALFBE(1),IAL110(1)), (IALFBE(61),IAL111(1)), DAT00310  
2 (IALFBE(121),IAL112(1)), (IALFBE(181),IAL113(1)), (IALFBE(241), DAT00320  
3 IAL114(1)), (IALFBE(301),IAL115(1)), (IALFBE(361),IAL116(1)), DAT00330  
4 (IALFBE(421),IAL117(1)), (IALFBE(481),IAL118(1)), (IALFBE(541), DAT00340  
5 IAL119(1)), (IALFBE(601),IAL120(1)), (IALFBE(661),IAL121(1)), DAT00350  
6 (IALFBE(721),IAL122(1)), (IALFBE(781),IAL123(1)), (IALFBE(841), DAT00360  
7 IAL124(1)), (IALFBE(901),IAL125(1)), (IALFBE(961),IAL126(1)), DAT00370  
8 (IALFBE(1021),IAL127(1)), (IALFBE(1081),IAL128(1)) DAT00380  
EQUIVALENCE (IALFBE(1141),IAL129(1)), (IALFBE(1201),IAL130(1)), DAT00390  
2 (IALFBE(1261),IAL131(1)), (IALFBE(1321),IAL132(1)), (IALFBE(1381) DAT00400  
3, IAL133(1)), (IALFBE(1441),IAL134(1)), (IALFBE(1501),IAL135(1)), DAT00410  
4 (IALFBE(1561),IAL136(1)), (IALFBE(1621),IAL137(1)), (IALFBE(1681) DAT00420  
5, IAL138(1)), (IALFBE(1741),IAL139(1)), (IALFBE(1801),IAL140(1)), DAT00430  
6 (IALFBE(1861),IAL141(1)), (IALFBE(1921),IAL142(1)), (IALFBE(1981) DAT00440  
7, IAL143(1)), (IALFBE(2041),IAL144(1)), (IALFBE(2101),IAL145(1)), DAT00450  
8 (IALFBE(2161),IAL146(1)), (IALFBE(2221),IAL147(1)) DAT00460  
EQUIVALENCE (IALFBE(2281),IAL148(1)), (IALFBE(2341),IAL149(1)), DAT00470  
2 (IALFBE(2401),IAL150(1)), (IALFBE(2461),IAL151(1)), (IALFBE(2521) DAT00480  
3, IAL152(1)), (IALFBE(2581),IAL153(1)), (IALFBE(2641),IAL154(1)), DAT00490  
4 (IALFBE(2701),IAL155(1)), (IALFBE(2761),IAL156(1)), (IALFBE(2821) DAT00500  
5, IAL157(1)), (IALFBE(2881),IAL158(1)), (IALFBE(2941),IAL159(1)), DAT00510  
6 (IALFBE(3001),IAL160(1)), (IALFBE(3061),IAL161(1)), (IALFBE(3121) DAT00520  
7, IAL162(1)), (IALFBE(3181),IAL163(1)), (IALFBE(3241),IAL164(1)), DAT00530  
8 (IALFBE(3301),IAL165(1)), (IALFBE(3361),IAL166(1)) DAT00540  
EQUIVALENCE (IALFBE(3421),IAL167(1)), (IALFBE(3481),IAL168(1)), DAT00550  
2 (IALFBE(3541),IAL169(1)), (IALFBE(3601),IAL170(1)), (IALFBE(3661) DAT00560  
3, IAL171(1)), (IALFBE(3721),IAL172(1)), (IALFBE(3781),IAL173(1)), DAT00570  
4 (IALFBE(3841),IAL174(1)), (IALFBE(3901),IAL175(1)), (IALFBE(3961) DAT00580  
5, IAL176(1)), (IALFBE(4021),IAL177(1)), (IALFBE(4081),IAL178(1)), DAT00590  
6 (IALFBE(4141),IAL179(1)), (IALFBE(4201),IAL180(1)), (IALFBE(4261) DAT00600  
7, IAL181(1)), (IALFBE(4321),IAL182(1)), (IALFBE(4381),IAL183(1)), DAT00610  
8 (IALFBE(4441),IAL184(1)), (IALFBE(4501),IAL185(1)) DAT00620  
EQUIVALENCE (IALFBE(4561),IAL186(1)), (IALFBE(4621),IAL187(1)), DAT00630

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2 (IALFBE(4681),IAL188(1)) DAT00640
EQUIVALENCE (WIDTH(1),WID110(1)), (WIDTH(101),WID111(1)),
2 (WIDTH(201),WID112(1)), (WIDTH(301),WID113(1)), (WIDTH(401),
3 WID114(1)) DAT00650
EQUIVALENCE (ISTART(1),IST110(1)), (ISTART(101),IST111(1)),
2 (ISTART(201),IST112(1)), (ISTART(301),IST113(1)), (ISTART(401),
3 IST114(1)) DAT00660
EQUIVALENCE (ISYMB0(1),ISY110(1)), (ISYMB0(61),ISY111(1)),
2 (ISYMB0(121),ISY112(1)) DAT00670
DATA IA /256*511/
DATA IFORT /1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,1HK,1HL,1HM,
2 1HN,1HO,1HP,1HQ,1HR,1HS,1HT,1HU,1HV,1HW,1HX,1HY,1HZ,1H ,1HO,1H1,
3 1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9,1H+,1H-,1H/,1H=,1H(,1H),1H*,1H,, DAT00680
4 1H.,1H$/ DAT00690
C ***** DAT00700
C THE IMPLEMENTOR MUST SUPPLY THE FOLLOWING TWO CARDS TO SUIT THE DAT00710
C INSTALLATION. NWORD=BITS/WORD, NCHAR=BITS/CHARACTER DAT00720
C DATA ISPEC /1H\,1H",1H0,1H#,1H&,1H^,1H%,1H?,1H!,1H:,1H:/ DAT00730
C DATA NWORD /36/ ,NCHAR /6/ ,IOUT /6/ DAT00740
C ***** DAT00750
C DATA FIRST /.TRUE./ ,LNGTH /.FALSE./ DAT00760
DATA ISY110 /471149226,357246358,315959338,336592896,470820906,
2 345320100,357443862,327886236,315762474,336920576,470820906, DAT00770
3 355313115,336920576,470493226,449850016,0,455911911,456370649,0, DAT00780
4 471149216,336274848,336930848,0,4704943226,357574048,336920576, DAT00790
5 449522346,315959958,0,470820906,355641947,336274907,317892650,0, DAT00800
6 456370208,336279584,351502336,481470811,325953253,347256234, DAT00810
7 326284694,325958294,346929184,357892096,449850016,470493226, DAT00820
8 455911911,485271143,0,450177706,315304598,315949056,470493226,0, DAT00830
9 470820906,355313115,336935525,336274917,355631104,470853600/ DAT00840
DATA ISY111 /336570464,336625664,468592477,328181537,330409956, DAT00850
2 338831587,345024799,342796380,334364672,466265814,319563163, DAT00860
3 313468258,315794984,326444971,341158250,353643173,359738078, DAT00870
4 357411352,346761365,332038144,465905227,312910991,300491605, DAT00880
5 292332190,290530023,297116654,307799411,322611126,341518837, DAT00890
6 360295345,372714731,380874146,382676313,376089682,365406925, DAT00900
7 350595210,331677696,468592477,328181537,330409956,338831587, DAT00910
8 345024799,342796380,334378847,330344289,466560930,468625379, DAT00920
9 470722595,472819811,474949794,477079777,0,462300964,345123100, DAT00930
* 328087389,330413981,332511197,334608413,336705629,338802845/ DAT00940
DATA ISY112 /340900061,342982656,470623971,347187226,464594973, DAT00950
2 342964256,334571552,338755584/ DAT00960
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 7 321431119,319202636,306586637,300365341,317662559,307209182, DAT07840  
 8 298754971,300721621,321496721,323462733,319169867,306553804, DAT07850  
 9 296166350,455550348,0,445653771,445555531,293975325,325429003, DAT07860  
 \* 445654795,434677329,432547472/ DAT07870  
 DATA IAL178 /0,433070987,435135436,433071520,321889950,325986009, DAT07880  
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 3 321562260,325658319,323397196,314942347,434808213,321529490, DAT07900  
 4 323462733,314975180,0,462268125,321889760,309339231,300852123, DAT07910  
 5 296493907,298329038,304489675,317040204,325527312,462268123, DAT07920  
 6 323921502,317695199,305079259,298591123,300426317,308684236, DAT07930  
 7 321300110,325592848,0,433070987,435135436,433071456,319792797, DAT07940  
 8 325953304,327788240,323429900,312845195,435135839,319759965, DAT07950  
 9 323856088,325691024,321332749,312878028,0,433070987,435135436, DAT07960  
 \* 433071776,435136159,324023254/ DAT07970  
 DATA IAL179 /313206101,434808149,434513548,323335051,323321856, DAT07980  
 2 433070987,435135435,298169248,324023263,323987104,434840918, DAT07990  
 3 313177045,313163776,462268125,321889760,309339231,300852123, DAT08000  
 4 296493907,298329038,304489675,317040204,325527312,327820756, DAT08010  
 5 462268123,323921502,317695199,305079325,300786584,298427344, DAT08020  
 6 302457933,308684236,321300110,325592787,317302228,0,433070987, DAT08030  
 7 433071072,300262283,462431968,325429003,462432011,434841302, DAT08040  
 8 434808533,0,433070987,300266400,300950475,0,449848720,312911052, DAT08050  
 9 304489421,298328912,449848800,317203853,312878283,304456652, DAT08060  
 \* 298230608,0,433070987,300266400/ DAT08070  
 DATA IAL180 /300950475,462431968,300562208,300528791,325429003, DAT08080  
 2 443262731,0,433070987,433071072,300299212,323364491,432383627,0, DAT08090  
 3 433070987,435004363,298169307,314946464,315045792,315045723, DAT08100  
 4 314947419,329623435,466626443,0,433070987,435069899,298169309, DAT08110  
 5 327529376,325531360,325531360,328214283,0,443556959,300852123, DAT08120  
 6 296493907,298329038,304489675,317040204,325527312,329885528, DAT08130  
 7 328050397,321889760,309343519,305079259,298591123,300426317, DAT08140  
 8 310781324,321300176,327788312,325953118,315598111,0,433070987, DAT08150  
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 \* 300594143,317695582/ DAT08170  
 DATA IAL181 /323888793,321627606,300613632,443556959,300852123, DAT08180  
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3 328050397, 321889760, 309343519, 305079259, 298591123, 300426317, DAT08200  
 4 310781324, 321300176, 327788312, 325953118, 315598111, 449259209, DAT08210  
 5 327464334, 317138697, 0, 433070987, 435135435, 298169248, 315631199, DAT08220  
 6 323954396, 325887639, 321594773, 300594143, 315598430, 323888793, DAT08230  
 7 321627542, 300627221, 323331787, 447391435, 0, 460236383, 315630752, DAT08240  
 8 300917597, 296592281, 300688471, 315270676, 321496721, 323429965, DAT08250  
 9 314975372, 302425038, 296171229, 321824286, 315597983, 300884893, DAT08260  
 \* 298689497, 304883094, 319465107, 325625550, 321267083/, DAT08270  
 DATA IAL182 /306553804, 296157184, 441427083, 443524299, 306557728, DAT08280  
 2 321922655, 428876575, 321880064, 433070993, 300360780, 310748555, DAT08290  
 3 321267406, 327722784, 433071072, 300459022, 304522508, 314975821, DAT08300  
 4 323430097, 326117152, 0, 428877067, 428876640, 310851360, 326116622, DAT08310  
 5 462431499, 0, 428876939, 428876640, 306656736, 306556733, 306558429, DAT08320  
 6 327529952, 327628960, 338700046, 475014923, 0, 430974603, 325432160, DAT08330  
 7 298854091, 460334752, 296072928, 298165067, 0, 428877014, 308651275, DAT08340  
 8 428876640, 311113440, 324019414, 460334358, 310738944, 458236747, DAT08350  
 9 460333963, 430974688, 430973791, 323990412, 325461707, 430286539, 0, DAT08360  
 \* 455910987, 323335769/, DAT08370  
 DATA IAL183 /323790475, 455812568, 313304217, 302785430, 296330065, DAT08380  
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 3 298361806, 302425228, 312878670, 0, 433070987, 300266400, 300950475, DAT08400  
 4 434840664, 309110169, 319563414, 325691089, 323429900, 314942667, DAT08410  
 5 304489422, 434840792, 315368983, 321595027, 323528270, 319202700, DAT08420  
 6 308683726, 0, 455812568, 313304217, 302785430, 296330065, 298263564, DAT08430  
 7 306554187, 317072974, 455812629, 317433176, 306979863, 300622739, DAT08440  
 8 298361806, 302425228, 312878541, 319268430, 0, 456140363, 323335776, DAT08450  
 9 324019851, 455812568, 313304217, 302785430, 296330065, 298263564, DAT08460  
 \* 306554187, 317072974, 455812440, 306979863/, DAT08470  
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 3 312845772, 321336211, 319399445, 317433176, 306979863, 300622739, DAT08500  
 4 298361806, 302425228, 312878541, 319268430, 0, 447751392, 305112092, DAT08510  
 5 302359627, 447751519, 309306462, 441427036, 304460633, 311207192, DAT08520  
 6 430744408, 311164928, 458008153, 321201671, 316876101, 308454470, DAT08530  
 7 302228359, 458008202, 321103301, 312616068, 302162823, 455812568, DAT08540  
 8 313304217, 302785430, 296330065, 298263564, 306554187, 317072974, DAT08550  
 9 455812440, 306979863, 300622739, 298361806, 302425228, 312878670, 0, DAT08560  
 \* 433070987, 300266400, 300950475, 434807960/, DAT08570  
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 3 298857375, 298787806, 300917663, 432841611, 300266393, 300721099, 0, DAT08600  
 4 433070943, 296690589, 300852254, 303014880, 298857375, 298787806, DAT08610  
 5 300917663, 432841604, 30037017, 300721092, 0, 433070987, 300266400, DAT08620  
 6 300950475, 458008153, 300398233, 300364946, 319137419, 443131531, 0, DAT08630  
 7 433070987, 300266400, 300950475, 0, 432841611, 300266393, 300721099, DAT08640  
 8 434807960, 311207385, 321660565, 323335125, 306947352, 315368983, DAT08650  
 9 321562187, 323335829, 330049497, 340568344, 346728779, 457877335, DAT08660  
 \* 334243928, 342599957, 344303947/, DAT08670  
 DATA IAL186 /0, 432841611, 300266393, 300721099, 434807960, 311207385, DAT08680  
 2 321660565, 323335125, 306947352, 315368983, 321562187, 323321856, DAT08690  
 3 441230360, 298525523, 296264590, 302392459, 312845772, 321332881, DAT08700  
 4 323593814, 317465945, 307016856, 302752726, 298427281, 300360717, DAT08710  
 5 306586956, 317105678, 321431123, 319497687, 313271448, 0, 432841604, DAT08720  
 6 300037017, 300721092, 434840664, 309110169, 319563414, 325691089, DAT08730  
 7 323429900, 314942667, 304489422, 434840792, 315368983, 321595027, DAT08740  
 8 323528270, 319202700, 308683726, 0, 455910980, 323106393, 323790468, DAT08750  
 9 455812568, 313304217, 302785430, 296330065, 298263564, 306554187, DAT08760  
 \* 317072974, 455812440, 306979863, 300622739/, DAT08770  
 DATA IAL187 /298361806, 302425228, 312878670, 0, 432841611, 300266393, DAT08780  
 2 300721099, 434742294, 306980121, 317502419, 302687383, 311174616, DAT08790  
 3 317489152, 453715416, 311207001, 298591062, 298460179, 313042384, DAT08800  
 4 449357263, 317138316, 451323148, 304489357, 434512782, 296171030, DAT08810  
 5 317400472, 451650840, 304882583, 434906006, 300561301, 302654802, DAT08820

6 317236751, 319235532, 310748235, 298197838, 0, 435168203, 302363616, DAT08830  
 7 303047691, 428647641, 309080857, 294397144, 0, 432841615, 300295243, DAT08840  
 8 310748556, 321368985, 300721103, 302425228, 310781325, 321369689, DAT08850  
 9 321234571, 455911065, 323321856, 428647563, 428647257, 306624025, DAT08860  
 \* 317498509, 453813387, 0, 430744715/ DAT08870  
 DATA IAL188 /430744473, 306656665, 306656662, 306558358, 323335577, DAT08880  
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 3 455910937, 296072793, 298165067, 0, 428647563, 428647257, 306624025, DAT08900  
 4 317498509, 297940505, 306553796, 297926656, 451683147, 455910348, DAT08910  
 5 430745177, 430744408, 317469644, 321267275, 430286411, 0/ DAT08920  
 DATA WID110 /18., 21., 21., 21., 19., 18., 21., 22., 8., 16., 21., 17., 24., DAT08930  
 2 22., 22., 21., 22., 21., 20., 16., 22., 18., 24., 20., 18., 20., 18., 21., 17., DAT08940  
 3 18., 19., 20., 22., 22., 8., 21., 18., 24., 22., 18., 22., 22., 21., 18., 16., DAT08950  
 4 18., 20., 20., 22., 20., 19., 19., 18., 19., 18., 12., 19., 19., 8., 10., 17., 8. DAT08960  
 5, 30., 19., 19., 19., 19., 13., 17., 12., 19., 16., 22., 17., 16., 17., 21., 19., DAT08970  
 6 19., 18., 16., 15., 20., 21., 11., 18., 16., 21., 18., 16., 17., 22., 18., 20., DAT08980  
 7 20., 20., 22., 18., 23., 23./ DAT08990  
 DATA WID111 /20., 22., 21., 22., 21., 20., 23., 24., 11., 15., 22., 18., 25., DAT09000  
 2 23., 22., 22., 22., 22., 20., 19., 24., 20., 24., 20., 21., 20., 20., 22., 18., DAT09010  
 3 20., 21., 20., 24., 22., 11., 22., 20., 25., 23., 22., 22., 24., 22., 21., 19., DAT09020  
 4 19., 21., 20., 23., 22., 20., 21., 19., 21., 19., 13., 19., 22., 11., 11., 21., DAT09030  
 5 11., 33., 22., 20., 21., 20., 17., 17., 15., 22., 18., 24., 20., 19., 18., 23., DAT09040  
 6 21., 20., 19., 18., 18., 22., 23., 12., 20., 20., 23., 20., 17., 18., 22., 19., DAT09050  
 7 21., 20., 20., 22., 18., 23., 23./ DAT09060  
 DATA WID112 /20., 24., 21., 23., 23., 22., 22., 26., 13., 18., 23., 20., 27., DAT09070  
 2 25., 22., 23., 22., 24., 23., 21., 25., 20., 26., 22., 21., 22., 24., 24., 19., DAT09080  
 3 20., 17., 24., 24., 25., 24., 24., 25., 24., 24., 22., 26., 34., 10., 22., 31., DAT09090  
 4 19., 14., 14., 27., 22., 21., 19., 18., 21., 18., 15., 20., 21., 13., 13., 20., DAT09100  
 5 12., 33., 23., 18., 21., 20., 17., 17., 14., 23., 20., 29., 20., 21., 20., 14., DAT09110  
 6 14., 21., 16., 16., 10., 10., 10., 18., 24., 25., 11., 11., 11., 21., 24., 14., DAT09120  
 7 14., 8., 20., 14., 26., 22., 16./ DAT09130  
 DATA WID113 /20., 20., 20., 20., 20., 20., 20., 20., 20., 20., 20., 26., 26., 22., DAT09140  
 2 26., 14., 14., 16., 10., 10., 20., 20., 20., 20., 20., 20., 20., 20., 20., 20., DAT09150  
 3 20., 26., 26., 26., 22., 26., 14., 14., 16., 10., 10., 20., 21., 21., 21., 21., DAT09160  
 4 21., 21., 21., 21., 21., 26., 26., 22., 26., 15., 15., 17., 11., 11., 21., 20., DAT09170  
 5 20., 20., 20., 20., 20., 20., 20., 20., 20., 25., 25., 23., 25., 25., 14., 14., 16., DAT09180  
 6 11., 11., 19., 20., 20., 21., 21., 19., 18., 21., 22., 9., 17., 21., 17., 24., DAT09190  
 7 22., 22., 20., 22., 20., 20., 17./ DAT09200  
 DATA WID114 /22., 20., 26., 20., 19., 20., 20., 20., 18., 20., 18., 14., 20., DAT09210  
 2 20., 9., 9., 19., 9., 31., 20., 19., 20., 20., 14., 17., 11., 20., 16., 24., 18., DAT09220  
 3 16., 18./ DAT09230  
 DATA IST110 /1, 5, 16, 26, 34, 39, 43, 54, 58, 60, 66, 70, 73, 78, 82, 93, 100, 112 DAT09240  
 2, 120, 131, 134, 140, 143, 148, 151, 154, 158, 162, 173, 176, 180, 185, 189, 193, DAT09250  
 3 205, 207, 211, 214, 219, 223, 227, 238, 242, 249, 253, 256, 265, 275, 278, 287, DAT09260  
 4 296, 305, 314, 322, 331, 340, 344, 355, 360, 364, 370, 374, 376, 385, 390, 399, DAT09270  
 5 408, 417, 421, 430, 434, 439, 442, 447, 450, 455, 459, 471, 486, 494, 506, 515, DAT09280  
 6 526, 535, 549, 554, 563, 567, 577, 584, 598, 607, 613, 623, 632, 636, 644, 655, DAT09290  
 7 662, 672/ DAT09300  
 DATA IST111 /683, 690, 710, 726, 740, 749, 757, 775, 785, 790, 799, 809, 815, DAT09310  
 2 826, 834, 855, 868, 898, 918, 935, 942, 952, 958, 967, 975, 983, 990, 997, 1017, DAT09320  
 3 1023, 1029, 1038, 1045, 1055, 1080, 1085, 1095, 1101, 1112, 1120, 1133, 1154, DAT09330  
 4 1162, 1175, 1183, 1190, 1205, 1226, 1234, 1252, 1272, 1290, 1305, 1319, 1335, DAT09340  
 5 1350, 1360, 1388, 1399, 1406, 1417, 1427, 1432, 1450, 1461, 1478, 1494, 1509, DAT09350  
 6 1519, 1535, 1542, 1553, 1559, 1568, 1576, 1585, 1592, 1611, 1637, 1650, 1671, DAT09360  
 7 1686, 1701, 1716, 1737, 1744, 1757, 1767, 1779, 1789, 1810, 1825, 1834, 1849, DAT09370  
 8 1865, 1872, 1887, 1905, 1916, 1932/ DAT09380  
 DATA IST112 /1953, 1960, 1978, 1995, 2009, 2018, 2026, 2046, 2056, 2061, DAT09390  
 2 2071, 2081, 2087, 2098, 2106, 2126, 2138, 2167, 2185, 2202, 2209, 2220, 2226, DAT09400  
 3 2235, 2243, 2251, 2258, 2260, 2262, 2283, 2289, 2301, 2305, 2309, 2320, 2336, DAT09410  
 4 2360, 2373, 2377, 2381, 2384, 2391, 2399, 2402, 2406, 2415, 2435, 2454, 2473, DAT09420  
 5 2500, 2522, 2540, 2556, 2568, 2587, 2600, 2617, 2637, 2651, 2663, 2678, 2693, DAT09430  
 6 2701, 2725, 2742, 2757, 2776, 2791, 2803, 2817, 2825, 2842, 2855, 2874, 2894, DAT09440  
 7 2913, 2927, 2932, 2937, 2942, 2964, 2977, 2983, 2990, 2997, 3012, 3027, 3051, DAT09450

8 3056,3063,3070,3086,3098,3100,3102,3104,3123,3130,3135,3154/ DAT09460  
DATA IST113 /3177,3186,3189,3197,3205,3208,3217,3229,3232,3247, DAT09470  
2 3259,3262,3264,3266,3269,3275,3281,3285,3290,3293,3306,3325,3330,DAT09480  
3 3351,3373,3378,3396,3419,3433,3462,3485,3488,3490,3492,3495,3505,DAT09490  
4 3515,3519,3523,3526,3546,3566,3572,3592,3616,3620,3638,3660,3673,DAT09500  
5 3702,3724,3727,3729,3731,3734,3744,3754,3758,3762,3765,3784,3803,DAT09510  
6 3809,3825,3846,3853,3876,3904,3909,3941,3969,3976,3980,3984,3991,DAT09520  
7 4003,4015,4031,4042,4050,4074,4082,4102,4121,4136,4146,4154,4176,DAT09530  
8 4185,4189,4199,4208,4214,4224,4232,4252,4264,4287,4302,4323/ DAT09540  
DATA IST114 /4329,4341,4347,4357,4364,4371,4379,4396,4413,4429, DAT09550  
2 4446,4464,4474,4497,4508,4519,4530,4539,4543,4562,4573,4591,4608,DAT09560  
3 4625,4634,4656,4663,4674,4680,4690,4697,4704/ DAT09570  
END DAT09580

## APPENDIX II. FORTRAN V VERSION FOR UNIVAC 1108/1110

SUBROUTINE SYMBOL (X,Y,HEIGHT,TEXT,THETA,N)	SYM00010
*****	SYM00020
DIMENSION ISY110(60),ISY111(60),ISY112(8),JSTS(22),ISYMB(128)	SYM00030
DIMENSION IAL110(60),IAL111(60),IAL112(60),IAL113(60),IAL114(60),	SYM00040
2 IAL115(60),IAL116(60),IAL117(60),IAL118(60),IAL119(60),IAL120(60)	SYM00050
3,IAL121(60),IAL122(60),IAL123(60),IAL124(60),IAL125(60),IAL126(60)	SYM00060
4,IAL127(60),IAL128(60)	SYM00070
DIMENSION IAL129(60),IAL130(60),IAL131(60),IAL132(60),IAL133(60),	SYM00080
2 IAL134(60),IAL135(60),IAL136(60),IAL137(60),IAL138(60),IAL139(60)	SYM00090
3,IAL140(60),IAL141(60),IAL142(60),IAL143(60),IAL144(60),IAL145(60)	SYM00100
4,IAL146(60),IAL147(60)	SYM00110
DIMENSION IAL148(60),IAL149(60),IAL150(60),IAL151(60),IAL152(60),	SYM00120
2 IAL153(60),IAL154(60),IAL155(60),IAL156(60),IAL157(60),IAL158(60)	SYM00130
3,IAL159(60),IAL160(60),IAL161(60),IAL162(60),IAL163(60),IAL164(60)	SYM00140
4,IAL165(60),IAL166(60)	SYM00150
DIMENSION IAL167(60),IAL168(60),IAL169(60),IAL170(60),IAL171(60),	SYM00160
2 IAL172(60),IAL173(60),IAL174(60),IAL175(60),IAL176(60),IAL177(60)	SYM00170
3,IAL178(60),IAL179(60),IAL180(60),IAL181(60),IAL182(60),IAL183(60)	SYM00180
4,IAL184(60),IAL185(60)	SYM00190
DIMENSION IAL186(60),IAL187(60),IAL188(31),WID110(100),WID111(100)	SYM00200
2,WID112(100),WID113(100),WID114(32),IST110(100),IST111(100),	SYM00210
3 IST112(100),IST113(100),IST114(32)	SYM00220
DIMENSION IFORT(47),IA(256),IB(58),ISPEC(11),OLDX(6),OLDY(6)	SYM00230
DIMENSION IALFBE(4711),WIDTH(432),ISTART(432)	SYM00240
COMMON /IALPH/ WIDTH,IALFBE,ISTART,ISYMB,JSTS	SYM00250
COMMON /SAVE/ XL,OLDX,OLDY,IA,IB,NWORD,NCHAR,NCWD,IOUT,FIRST,LNGTH	SYM00260
LOGICAL FIRST,LNGTH	SYM00270
EQUIVALENCE (IB(1),IFORT(1)), (IB(48),ISPEC(1))	SYM00280
EQUIVALENCE (IALFBE(1),IAL110), (IALFBE(61),IAL111), (IALFBE(121),	SYM00290
2 IAL112), (IALFBE(181),IAL113), (IALFBE(241),IAL114), (IALFBE(301)	SYM00300
3,IAL115), (IALFBE(361),IAL116), (IALFBE(421),IAL117), (IALFBE(481)	SYM00310
4,IAL118), (IALFBE(541),IAL119), (IALFBE(601),IAL120), (IALFBE(661)	SYM00320
5,IAL121), (IALFBE(721),IAL122), (IALFBE(781),IAL123), (IALFBE(841)	SYM00330
6,IAL124), (IALFBE(901),IAL125), (IALFBE(961),IAL126),	SYM00340
7 (IALFBE(1021),IAL127), (IALFBE(1081),IAL128)	SYM00350
EQUIVALENCE (IALFBE(1141),IAL129), (IALFBE(1201),IAL130),	SYM00360
2 (IALFBE(1261),IAL131), (IALFBE(1321),IAL132), (IALFBE(1381),	SYM00370
3 IAL133), (IALFBE(1441),IAL134), (IALFBE(1501),IAL135),	SYM00380
4 (IALFBE(1561),IAL136), (IALFBE(1621),IAL137), (IALFBE(1681),	SYM00390
5 IAL138), (IALFBE(1741),IAL139), (IALFBE(1801),IAL140),	SYM00400
6 (IALFBE(1861),IAL141), (IALFBE(1921),IAL142), (IALFBE(1981),	SYM00410
7 IAL143), (IALFBE(2041),IAL144), (IALFBE(2101),IAL145),	SYM00420
8 (IALFBE(2161),IAL146), (IALFBE(2221),IAL147)	SYM00430
EQUIVALENCE (IALFBE(2281),IAL148), (IALFBE(2341),IAL149),	SYM00440
2 (IALFBE(2401),IAL150), (IALFBE(2461),IAL151), (IALFBE(2521),	SYM00450
3 IAL152), (IALFBE(2581),IAL153), (IALFBE(2641),IAL154),	SYM00460
4 (IALFBE(2701),IAL155), (IALFBE(2761),IAL156), (IALFBE(2821),	SYM00470
5 IAL157), (IALFBE(2881),IAL158), (IALFBE(2941),IAL159),	SYM00480
6 (IALFBE(3001),IAL160), (IALFBE(3061),IAL161), (IALFBE(3121),	SYM00490
7 IAL162), (IALFBE(3181),IAL163), (IALFBE(3241),IAL164),	SYM00500
8 (IALFBE(3301),IAL165), (IALFBE(3361),IAL166)	SYM00510
EQUIVALENCE (IALFBE(3421),IAL167), (IALFBE(3481),IAL168),	SYM00520
2 (IALFBE(3541),IAL169), (IALFBE(3601),IAL170), (IALFBE(3661),	SYM00530
3 IAL171), (IALFBE(3721),IAL172), (IALFBE(3781),IAL173),	SYM00540
4 (IALFBE(3841),IAL174), (IALFBE(3901),IAL175), (IALFBE(3961),	SYM00550
5 IAL176), (IALFBE(4021),IAL177), (IALFBE(4081),IAL178),	SYM00560
6 (IALFBE(4141),IAL179), (IALFBE(4201),IAL180), (IALFBE(4261),	SYM00570
7 IAL181), (IALFBE(4321),IAL182), (IALFBE(4381),IAL183),	SYM00580

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8 (IALFBE(4441), IAL184), (IALFBE(4501), IAL185) SYM00610
EQUIVALENCE (IALFBE(4561), IAL186), (IALFBE(4621), IAL187), SYM00620
2 (IALFBE(4681), IAL188) SYM00630
EQUIVALENCE (WIDTH(1), WID110), (WIDTH(101), WID111), (WIDTH(201), SYM00640
2 WID112), (WIDTH(301), WID113), (WIDTH(401), WID114) SYM00650
EQUIVALENCE (ISTART(1), IST110), (ISTART(101), IST111), (ISTART(201) SYM00660
2, IST112), (ISTART(301), IST113), (ISTART(401), IST114) SYM00670
EQUIVALENCE (ISYMB0(1), ISY110), (ISYMB0(61), ISY111), (ISYMB0(121), SYM00680
2 ISY112) SYM00690
DATA IA /256*511/ SYM00700
DATA IFORT /1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,1HK,1HL,1HM, SYM00710
2 1HN,1HO,1HP,1HQ,1HR,1HS,1HT,1HU,1HV,1HW,1HX,1HY,1HZ,1H ,1HO,1H1, SYM00720
3 1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9,1H+,1H-,1H/,1H=,1H(,1H),1H*,1H,, SYM00730
4 1H.,1H$/ SYM00740
SYM00750
***** SYM00760
SYM00770
THE IMPLEMENTOR MUST SUPPLY THE FOLLOWING TWO CARDS TO SUIT THE SYM00780
INSTALLATION. NWORD=BITS/WORD, NCHAR=BITS/CHARACTER SYM00790
DATA ISPEC /1H\,1H",1H\$,1H\#,1H\&,1H^,1H%,1H?,1H!,1H:,1H:/ SYM00800
DATA NWORD /36/ ,NCHAR /6/ ,IOUT /6/ SYM00810
SYM00820
***** SYM00830
SYM00840
DATA FIRST /.TRUE./ ,LNGTH /.FALSE./ SYM00850
DATA ISY110 /471149226,357246358,315959338,336592896,470820906, SYM00860
2 345320100,357443862,327886236,315762474,336920576,470820906, SYM00870
3 355313115,336920576,470493226,449850016,0,455911911,456370649,0, SYM00880
4 471149216,336274848,336930848,0,470493226,357574048,336920576, SYM00890
5 449522346,315959958,0,470820906,355641947,336274907,317892650,0, SYM00900
6 456370208,336279584,351502336,481470811,325953253,347256234, SYM00910
7 326284694,325958294,346929184,357892096,449850016,470493226, SYM00920
8 455911911,485271143,0,450177706,315304598,315949056,470493226,0, SYM00930
9 470820906,355313115,336935525,336274917,355631104,470853600/ SYM00940
DATA ISY111 /336570464,336625664,468592477,328181537,330409956, SYM00950
2 338831587,345024799,342796380,334364672,466265814,319563163, SYM00960
3 313468258,315794984,326444971,341158250,353643173,359738078, SYM00970
4 357411352,346761365,332038144,465905227,312910991,300491605, SYM00980
5 292332190,290530023,297116654,307799411,322611126,341518837, SYM00990
6 360295345,327214731,380874146,382676313,376089682,365406925, SYM01000
7 350595210,331677696,468592477,328181537,330409956,338831587, SYM01010
8 345024799,342796380,334378847,330344289,466560930,468625379, SYM01020
9 470722595,472819811,474949794,477079777,0,462300964,345123100, SYM01030
* 328087389,330413981,332511197,334608413,336705629,338802845/ SYM01040
DATA ISY112 /340900061,342982656,470623971,347187226,464594973, SYM01050
2 342964256,334571552,338755584/ SYM01060
DATA (JSTS sym(I), I=1,22) /1,5,11,14,17,20,24,27,30,35,38,45,50,53, SYM01070
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DATA IAL110 /443556555,443556579,432612882,0,433070987,433071584, SYM01090
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3 327657165,323364299,298156032,462268125,321889760,309339231, SYM01110
4 300852123,296493907,298329038,304489675,317040204,325527312,0, SYM01120
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 4 329754514, 332048216, 327974912, 445653835, 445654731, 445556363, SYM02180  
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3	298525591,300688473,313304536,319530581,321332876,325432855,	SYM03170
4	319235660,325429003,453682644,304718738,296231758,298198091,	SYM03180
5	310748556,319239251,300491664,298263500,304447488,435168203,	SYM03190
6	437265419,436937880,311207321,321660630,327788305,325527116,	SYM03200
7	314942731,306586638,449619480,323692243,325625486,319169931,	SYM03210
8	428876832,0,455812629,321529493,323692056,315401433,302785430,	SYM03220
9	296330065,298263564,308651339,319170190,443327576,300622739,	SYM03230
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3	449848992,455452491,0,432645779,323659351,319563161,309109784,	SYM03270
4	298525523,296264590,302392523,312845836,323434067,321594904,	SYM03280
5	443327576,300622739,298361806,304489675,0,445621470,311338334,	SYM03290
6	313500960,307242015,300852171,441459807,302949387,428647705,	SYM03300
7	428188875,0,441230360,300655509,298427345,302523535,310879632,	SYM03310
8	317236755,319464919,315368729,307016728,300622802,302527888,	SYM03320
9	317269462,315373015,319563417,323757592,434676624,296166221,	SYM03330
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2	296035339,0,435168203,437265419,436937880,313304537,323757782,	SYM03360
3	325432793,321660566,323334944,303051531,308655563,331710464,	SYM03370
4	435168159,300885023,300954585,300266521,302363417,302822155,	SYM03380
5	308641792,437265375,302982239,303051865,304325637,297935620,	SYM03390
6	291676870,293839686,293778457,302228421,297939801,304906240,	SYM03400
7	435168203,437265419,458007567,447325899,445228683,428876832,	SYM03410
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 3 302785493,300524560,306652493,317105806,327690067,329951000, SYM04960  
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 5 306979864,298558293,296330129,302523536,310945106,319497815, SYM04980  
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 7 449717643,432940956,432678804,0,432908045,462267277,0,451847580, SYM05000  
 8 317564444,317633428,336213453,314975691,319169997,0,439493700, SYM05010

9	441590916, 479340804, 481438020, 431106660, 430056836, 469903940, 0,	SYM05020
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2	435299926, 297939876, 319501156, 319468388, 345123229, 343028677,	SYM05050
3	344109956, 344074635, 341966848, 447751327, 302916570, 298558290,	SYM05060
4	296166284, 302359691, 312878543, 319333972, 323790493, 321889760,	SYM05070
5	313537888, 309306460, 302851031, 298394510, 300295179, 440771852,	SYM05080
6	315074001, 319432281, 321824287, 317731798, 319488000, 443688035,	SYM05090
7	303113184, 300885020, 304981145, 306947093, 439460897, 303015005,	SYM05100
8	307111130, 309077142, 298460306, 308815054, 306586699, 302294023,	SYM05110
9	304264211, 306750607, 304522252, 300229576, 302195781, 308412416,	SYM05120
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1	307209309/	SYM05140
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4	319301265, 325694875, 311207126, 308913425, 313014043, 325691089,	SYM05180
5	329787344, 338241685, 340502618, 336471966, 328181344, 315630815,	SYM05190
6	305079260, 298656599, 296362897, 300393549, 308684171, 321234700,	SYM05200
7	331786190, 464365331, 327722832, 0, 434938776, 296428372, 298361997,	SYM05210
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3	298230732, 304456907, 312878543, 319370457, 304882645, 298394510,	SYM05270
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5	311207321, 319563351, 323659410, 321365452, 310748299, 302392271,	SYM05290
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5	307012555, 298033989, 451945822, 311305432, 304587787, 300163974,	SYM05390
6	295871172, 287449605, 285418055, 289612357, 432842265, 0, 460105163,	SYM05400
7	314844421, 304227204, 293774022, 291742472, 295936774, 458007947,	SYM05410
8	312747205, 304231954, 319464920, 313304281, 302785429, 296297295,	SYM05420
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3	309342933, 294364057, 304915608, 306881551, 302392395, 437036120,	SYM05470
4	304784335, 300295179, 308651341, 315064320, 445654239, 311371103,	SYM05480
5	311440149, 296461273, 307012824, 308978699, 300163974, 295871172,	SYM05490
6	287449605, 285418055, 289612357, 439133336, 306881483, 298066758,	SYM05500
7	291635200, 441459467, 443556683, 457975383, 323692247, 325854873,	SYM05510
8	321693144, 308946003, 300528723, 308880716, 314946643, 306783500,	SYM05520
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*	308716815, 443556818, 298263436, 300266464, 309329920/	SYM05540
DATA	IAL155 /426418967, 298624089, 306979990, 304686027, 437036120,	SYM05550
2	304817170, 298169426, 309011800, 317498969, 325854999, 327853643,	SYM05560
3	455911127, 325756427, 459876182, 334243929, 342665560, 348891541,	SYM05570
4	344434956, 346405081, 346794325, 342337740, 344304075, 354855567, 0,	SYM05580
5	426418967, 298624089, 306979990, 304686027, 437036120, 304817170,	SYM05590
6	298169426, 309011800, 317498969, 325854999, 327853711, 323364555,	SYM05600
7	455911127, 325756495, 321267339, 329623501, 336035840, 443327512,	SYM05610
8	298492754, 296199053, 300295243, 308651404, 319268434, 321562135,	SYM05620
9	317465945, 309114073, 304882645, 298394510, 300299467, 312878543,	SYM05630
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 8 453748246,321594967,319563097,307012568,298558357,300557712,  
 9 317174678,300590481,317203917,314975435,302359372,294036238,  
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4	296231822	,302392523	,314943116	,327624529	,329918230	,323757529	,	SYM06280			
5	311211289	,304882646	,298427280	,300360780	,308655499	,321267406	,	SYM06290			
6	327722772	,325789272	,317489152	,441459806	,307111134	,307246240	,	SYM06300			
7	306787478	,304751824	,306652240	,308946070	,441001092	,440673350	,	SYM06310			
8	306324678	,306459417	,298591257	,298656537	,428647961	,445425048	,	SYM06320			
9	319595930	,311210763	,298132491	,298197771	,428189195	,444966282	,	SYM06330			
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DATA	IAL163	/312845836	,323462868	,325822108	,319792480	,309329920	,	SYM06350			
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3	323888794	,321660373	,296068811	,0	,435168928	,311174616	,321627798	,	SYM06370		
4	325691089	,323429900	,312845451	,300295053	,296189952	,451945298	,	SYM06380			
5	327759328	,317030400	,456139744	,2985558424	,307012953	,319563414	,	SYM06390			
6	325691089	,323429900	,312845451	,300295053	,296189952	,458139231	,	SYM06400			
7	315630880	,305112028	,298558354	,300360780	,310748491	,319170190	,	SYM06410			
8	325625554	,323659287	,313271576	,304849877	,298385408	,460334155	,	SYM06420			
9	430974688	,0	,441459679	,298754971	,300721240	,313239062	,323626706	,	SYM06430		
*	325559949	,321267083	,306553804	,298230607	/				SYM06440		
DATA	IAL164	/296297364	,302720215	,317466201	,323856029	,321889696	,	SYM06450			
2	307232768	,458008150	,317334803	,308913172	,298525529	,296559517	,	SYM06460			
3	303015136	,311436767	,321824409	,323626575	,317072651	,306553804	,	SYM06470			
4	298254336	,451847627	,432678932	,0	,432678932	,0	,466756356	,0	,432777239	SYM06480	
5	,432580625	,0	,447882466	,305112027	,298525586	,300328009	,308487492	,0	,	SYM06490	
6	431104994	,305112283	,311108882	,308716617	,300098372	,0	,441263246	,		SYM06500	
7	430679505	,451650385	,0	,436609995	,298197965	,302392330	,300163975	,0	,	SYM06510	
8	434545548	,300262412	,300318720	,441590919	,449979783	,460236383	,			SYM06520	
9	315630752	,300917597	,296592281	,300688471	,317367892	/				SYM06530	
DATA	IAL165	/323593937	,325527116	,314942603	,300294990	,0	,443556895	,	SYM06540		
2	298722135	,296362895	,302392523	,312845836	,323462868	,325822108	,	SYM06550			
3	319792480	,309343456	,305112094	,300819351	,298460111	,302425164	,	SYM06560			
4	308655435	,317072909	,321365652	,323724892	,319759839	,313524224	,	SYM06570			
5	437134493	,313533771	,445621515	,436577867	,0	,432939995	,298656603	,	SYM06580		
6	296625054	,300917920	,315631199	,323954396	,325920408	,317400212	,	SYM06590			
7	302621585	,296166219	,449848863	,321857180	,323823192	,315303060	,	SYM06600			
8	430351246	,302458188	,319170189	,325530638	,312845899	,323364558	,	SYM06610			
9	325582848	,432939995	,298656603	,296625054	,300917920	,315631199	,	SYM06620			
*	323921562	,321660311	,309048736	,319792733	,321725976	/			SYM06630		
DATA	IAL166	/315340183	,319497876	,325658319	,323397196	,314942603	,	SYM06640			
2	300295053	,296198992	,298361808	,298301013	,323561103	,321299980	,	SYM06650			
3	314933248	,449783179	,451945931	,451945233	,327726283	,323321856	,	SYM06660			
4	435168086	,430646232	,307012953	,319563414	,325691089	,323429900	,	SYM06670			
5	312845451	,300295053	,296198992	,298361808	,298300761	,317466198	,	SYM06680			
6	323593873	,321332684	,312849376	,321926111	,311404128	,0	,456042012	,	SYM06690		
7	321758876	,323921503	,317728032	,305112029	,298689367	,296264590	,	SYM06700			
8	302392523	,312845836	,323430097	,325658261	,319530328	,311174231	,	SYM06710			
9	300589970	,445654175	,302949339	,298558353	,300360780	,308655435	,	SYM06720			
*	317072974	,323528338	,321562071	,313262080	,430973786	,430842782	/	SYM06730			
DATA	IAL167	/303047840	,317630045	,323954400	,433005599	,307209693	,	SYM06740			
2	460334813	,323822997	,313107728	,310752922	,313173267	,308815051	,0	,	SYM06750		
3	441459679	,298754970	,300688535	,315336280	,323823261	,321889696	,	SYM06760			
4	307246240	,303014877	,300753944	,306951575	,319563354	,321824287	,	SYM06770			
5	315634839	,300622741	,296330063	,298230732	,306554251	,321267341	,	SYM06780			
6	325560019	,323659350	,3153339927	,302719957	,298427279	,300327948	,	SYM06790			
7	306558347	,319170125	,323462803	,321562134	,315326464	,458008150	,	SYM06800			
8	317334803	,308913172	,298525529	,296559517	,303015136	,313533983	,	SYM06810			
9	323921626	,325723792	,321332684	,310748235	,300295054	,298296272	,	SYM06820			
*	302490574	,443130964	,300622745	,298656733	,305112288	,447751647	/	SYM06830			
DATA	IAL168	/321824410	,323626576	,319235468	,310738944	,451847627	,	SYM06840			
2	432678932	,0	,432678932	,0	,466756356	,0	,432777239	,432580625	,0	,	SYM06850
3	447882466	,305112027	,298525586	,300328009	,308487492	,443622494	,			SYM06860	
4	302883798	,300491789	,304424134	,0	,431104994	,305112283	,311108882	,		SYM06870	
5	308716617	,300098372	,435233886	,307078358	,308880525	,304423878	,0	,		SYM06880	
6	441459860	,430876119	,451846999	,0	,434480012	,300327948	,302326728	,		SYM06890	
7	298024960	,434545548	,300262412	,300318720	,441590919	,449979783	,			SYM06900	

8	458139228	,323856092	,326018655	,315630752	,300917597	,296592281	SYM06910
9	300688471	,317367892	,325661531	,300721240	,317400661	,323626706	SYM06920
*	325527116/						SYM06930
DATA	IAL169	/314942603	,300294990	,296199056	,300393358	,0,449848543,	SYM06940
2	305046490	,298558291	,296231821	,300295243	,308651404	,319235729,	SYM06950
3	325723928	,328050398	,323986976	,315635104	,311403677	,302851031,	SYM06960
4	298427280	,300328011	,442869068	,317138513	,323626712	,325953182,	SYM06970
5	319815680	,449717323	,454042763	,454042973	,307078170	,451847387,	SYM06980
6	302841856	,439231643	,304948251	,302916702	,307209568	,319825631,	SYM06990
7	328115995	,325887575	,315270291	,300458831	,291878432	,323987165,	SYM07000
8	325953177	,319530131	,428254030	,300360972	,317072973	,323466190,	SYM07010
9	310748619	,321267343	,0,439231643	,304948251	,302916702	,307209568,	SYM07020
*	319825631	,328115995	,325887511	,313210400	,323987165/		SYM07030
DATA	IAL170	/325953177	,319534294	,313206293	,321529490	,323462733,	SYM07040
2	319169867	,304456588	,296133391	,294134609	,298328911	,447423957,	SYM07050
3	319432274	,321365517	,317072715,0	,458204427	,460334411	,460333841,	SYM07060
4	327712768	,443556758	,443557728	,443524639	,330314646	,300655768,	SYM07070
5	313271831	,321595028	,323528270	,317072651	,304456588	,296133391,	SYM07080
6	294134609	,298328911	,447489495	,319497812	,321431054	,314975499,0,	SYM07090
7	460236444	,325953308	,328115935	,321922464	,309306461	,300753815,	SYM07100
8	296330063	,298230732	,304456971	,317072974	,323495571	,321562134,	SYM07110
9	315335895	,304817108	,298399136	,311403677	,302851031	,298427278,	SYM07120
*	300299531	,314975758	,321398356	,319488000	,437265306/		SYM07130
DATA	IAL171	/464529181	,323822932	,308847759	,304461466	,311043217,	SYM07140
2	304587787	,435070112	,311436893	,437200031	,311404125	,326018846,	SYM07150
3	330301440	,447751327	,305079324	,302818391	,309011862	,323725016,	SYM07160
4	328017693	,326084128	,313537888	,309306526	,305013849	,306947286,	SYM07170
5	449521239	,323757786	,326018719	,319829206	,300589907	,294167310,	SYM07180
6	296100875	,310748684	,321300111	,323561044	,319464854	,443229205,	SYM07190
7	298427217	,296166284	,302363915	,317072909	,321365587	,319455232,	SYM07200
8	460105367	,319464852	,308946005	,302719960	,300786717	,307209568,	SYM07210
9	319825567	,326051612	,327952084	,323528206	,314975435	,302359436,	SYM07220
*	296166223	,298329039	,298267733	,302752795	,305046751	,313538207,	SYM07230
1	326018776/						SYM07240
DATA	IAL172	/323626577	,317138252	,308641792	,451847627	,432678932,0,	SYM07250
2	432678932,0	,475144708,0	,432777239	,432580625,0	,456271201	,307176475	SYM07260
3	298558290	,296166281	,300098564	,447784093	,302818262	,298361740,	SYM07270
4	300131332,0	,443688226	,313501082	,313503249	,308716618	,298033796,	SYM07280
5	443688225	,313402711	,310977743	,304456583,0	,445654292	,435070551,	SYM07290
6	456041431,0	,430285580	,296133516	,298165065	,291733504	,430351116,	SYM07300
7	296067980	,296124416	,449979271	,460465351	,462300891	,328017755,	SYM07310
8	330180382	,326084128	,311436383	,300852187	,302818392	,319432338,	SYM07320
9	435004505	,319465044	,323561103	,321299980	,312845387	,298197837/	SYM07330
DATA	IAL173	/294101776	,296264592	,296189952	,443556895	,298722135,	SYM07340
2	296362895	,302392523	,312845836	,323462868	,325822108	,319792480,	SYM07350
3	309343327	,300819351	,298460111	,304493581	,308684108	,319206860,	SYM07360
4	321365652	,323724892	,317699614	,313500895	,302972928	,437134493,	SYM07370
5	313533771	,437134363	,307111198	,310748491,0	,432907164	,300885023,	SYM07380
6	307242400	,319792734	,323888794	,321660373	,298169243	,300786652,	SYM07390
7	302982303	,315598366	,321791578	,319563157	,296072076	,325461707,	SYM07400
8	430286539,0	,435168928	,309048288	,300918367	,456139927	,443295064,	SYM07410
9	319530645	,325658321	,323429900	,312845451	,300295053	,296199055,	SYM07420
*	441165143	,319497875	,449554005	,323561105	,321332620/		SYM07430
DATA	IAL174	/457713165	,312878220	,300327823	,438707086,0	,451847627,	SYM07440
2	319141408	,319141408	,296232720	,451847056	,432580369	,327680000,	SYM07450
3	435168151	,437232600	,435168864	,321893407	,321893336	,307012953,	SYM07460
4	319563414	,325691089	,323429900	,312845451	,300295053	,296199055,	SYM07470
5	432776151	,304883032	,319530644	,449586774	,323593873	,321332620,	SYM07480
6	457713165	,312878220	,300327823	,438707086,0	,454010461	,323921503,	SYM07490
7	315630880	,305112028	,298558354	,300360780	,310748491	,319170190,	SYM07500
8	325625554	,323659287	,313271576	,304849877	,456074655	,311403614,	SYM07510
9	441426972	,300655570	,302458060	,434644045	,310781260	,319202960,	SYM07520
*	449193550	,323528338	,321562007	,457811478	,313238807/		SYM07530

DATA IAL175 /304817107,443261973,300482560,430974688,304460640,  
 2 296724127,458236939,304447488,441459679,298754971,300721176,  
 3 306947478,319465044,323561103,321299852,306586573,298296210,  
 4 300557333,306914711,319563353,323856029,321889696,307246111,  
 5 300852187,302818456,315336214,323626706,325559949,321267083,  
 6 306553804,298230607,296297364,302720151,315368985,321758813,  
 7 319796830,315597983,300888974,304494028,323420160,455812564,  
 8 311010515,302654358,296526682,298755103,309339424,317695581,  
 9 323790484,321365452,310748299,300295054,300360716,455910934,  
 \* 313144920,317367572,308945941,298595476,300622745,298656733,  
 1 307213211/  
 DATA IAL176 /302982367,311403998,321762655,319727193,321529359,  
 2 314979789,310781068,300318720,449750412,317076893,317629900,  
 3 432711637,334115733,298461140,0,432711637,334115733,298461140,0,  
 4 466756356,295843748,334635844,0,432842713,334246809,298592216,  
 5 432580561,333984657,298330064,0,445785250,303014811,296428370,  
 6 298230793,306390276,312620324,313664738,305112027,298525586,  
 7 300328009,308487492,0,431104994,305112283,311108882,308716617,  
 8 300098372,297939812,298984482,307209499,313206098,310813833,  
 9 302195588,0,441459807,308978836,441459860,441459935,304784532,  
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 DATA IAL177 /315336151,430876119,430875484,317466071,451847581,  
 2 298558295,451846999,451847644,296493911,0,438707211,300262284,  
 3 298230734,302457933,304423944,298038221,300295180,302425037,  
 4 436577354,438707208,0,434578317,298197963,302359628,304522254,  
 5 300364749,300295180,302425037,0,443688135,310621412,311567623,  
 6 453944989,319792480,307241951,296657755,298623960,317335059,  
 7 321431119,319202636,306586637,300365341,317662559,307209182,  
 8 298754971,300721621,321496721,323462733,319169867,306553804,  
 9 296166350,455550348,0,445653771,445555531,293975325,325429003,  
 \* 445654795,434677329,432547472/  
 DATA IAL178 /0,433070987,435135436,433071520,321889950,325986009,  
 2 323724886,315274207,315598430,323888793,321627542,434840982,  
 3 321562260,325658319,323397196,314942347,434808213,321529490,  
 4 323462733,314975180,0,462268125,321889760,309339231,300852123,  
 5 296493907,298329038,304489675,317040204,325527312,462268123,  
 6 323921502,317695199,305079259,298591123,300426317,308684236,  
 7 321300110,325592848,0,433070987,435135436,433071456,319792797,  
 8 325953304,327788240,323429900,312845195,435135839,319759965,  
 9 323856088,325691024,321332749,312878028,0,433070987,435135436,  
 \* 433071776,435136159,324023254/  
 DATA IAL179 /313206101,434808149,434513548,323335051,323321856,  
 2 433070987,435135435,298169248,324023263,323987104,434840918,  
 3 313177045,313163776,462268125,321889760,309339231,300852123,  
 4 296493907,298329038,304489675,317040204,325527312,327820756,  
 5 462268123,323921502,317695199,305079325,300786584,298427344,  
 6 302457933,308684236,321300110,325592787,317302228,0,433070987,  
 7 433071072,300262283,462431968,325429003,462432011,434841302,  
 8 434808533,0,433070987,300266400,300950475,0,449848720,312911052,  
 9 304489421,298328912,449848800,317203853,312878283,304456652,  
 \* 298230608,0,433070987,300266400/  
 DATA IAL180 /300950475,462431968,300562208,300528791,325429003,  
 2 443262731,0,433070987,433071072,300299212,323364491,432383627,0,  
 3 433070987,435004363,298169307,314946464,315045792,315045723,  
 4 314947419,329623435,466626443,0,433070987,435069899,298169309,  
 5 327529376,325531360,325531360,328214283,0,443556959,300852123,  
 6 296493907,298329038,304489675,317040204,325527312,329885528,  
 7 328050397,321889760,309343519,305079259,298591123,300426317,  
 8 310781324,321300176,327788312,325953118,315598111,0,433070987,  
 9 435135435,298169248,317728351,323954396,325887639,321594837,  
 \* 300594143,317695582/  
 DATA IAL181 /323888793,321627606,300613632,443556959,300852123,  
 2 296493907,298329038,304489675,317040204,325527312,329885528,  
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3	328050397	, 321889760, 309343519, 305079259, 298591123, 300426317,	SYM08170
4	310781324	, 321300176, 327788312, 325953118, 315598111, 449259209,	SYM08180
5	327464334	, 317138697, 0, 433070987, 435135435, 298169248, 315631199,	SYM08190
6	323954396	, 325887639, 321594773, 300594143, 315598430, 323888793,	SYM08200
7	321627542	, 300627221, 323331787, 447391435, 0, 460236383, 315630752,	SYM08210
8	300917597	, 296592281, 300688471, 315270676, 321496721, 323429965,	SYM08220
9	314975372	, 302425038, 296171229, 321824286, 315597983, 300884893,	SYM08230
*	298689497	, 304883094, 319465107, 325625550, 321267083/,	SYM08240
	DATA IAL182 / 306553804, 296157184, 441427083, 443524299, 306557728,	SYM08250	
2	321922655	, 428876575, 321880064, 433070993, 300360780, 310748555,	SYM08260
3	321267406	, 327722784, 433071072, 300459022, 304522508, 314975821,	SYM08270
4	323430097	, 326117152, 0, 428877067, 428876640, 310851360, 326116622,	SYM08280
5	462431499	, 0, 428876939, 428876640, 306656736, 306656733, 306558429,	SYM08290
6	327529952	, 327628960, 338700046, 475014923, 0, 430974603, 325432160,	SYM08300
7	298854091	, 460334752, 296072928, 298165067, 0, 428877014, 308651275,	SYM08310
8	428876640	, 311113440, 324019414, 460334358, 310738944, 458236747,	SYM08320
9	4603333963	, 430974688, 430973791, 323990412, 325461707, 430286539, 0,	SYM08330
*	455910987, 323335769/,	SYM08340	
	DATA IAL183 / 323790475, 455812568, 313304217, 302785430, 296330065,	SYM08350	
2	298263564	, 306554187, 317072974, 455812440, 306979863, 300622739,	SYM08360
3	298361806	, 302425228, 312878670, 0, 433070987, 300266400, 300950475,	SYM08370
4	434840664	, 309110169, 319563414, 325691089, 323429900, 314942667,	SYM08380
5	304489422	, 434840792, 315368983, 321595027, 323528270, 319202700,	SYM08390
6	308683726	, 0, 455812568, 313304217, 302785430, 296330065, 298263564,	SYM08400
7	306554187	, 317072974, 455812629, 317433176, 306979863, 300622739,	SYM08410
8	298361806	, 302425228, 312878541, 319268430, 0, 456140363, 323335776,	SYM08420
9	324019851	, 455812568, 313304217, 302785430, 296330065, 298263564,	SYM08430
*	306554187, 317072974, 455812440, 306979863/,	SYM08440	
	DATA IAL184 / 300622739, 298361806, 302425228, 312878670, 0, 432612946,	SYM08450	
2	321562135	, 317465945, 307012632, 298525523, 296264590, 302392459,	SYM08460
3	312845772	, 321336211, 319399445, 317433176, 306979863, 300622739,	SYM08470
4	298361806	, 302425228, 312878541, 319268430, 0, 447751392, 305112092,	SYM08480
5	302359627	, 447751519, 309306462, 441427036, 304460633, 311207192,	SYM08490
6	430744408	, 311164928, 458008153, 321201671, 316876101, 308454470,	SYM08500
7	302228359	, 458008202, 321103301, 312616068, 302162823, 455812568,	SYM08510
8	313304217	, 302785430, 296330065, 298263564, 306554187, 317072974,	SYM08520
9	455812440	, 306979863, 300622739, 298361806, 302425228, 312878670, 0,	SYM08530
*	433070987, 300266400, 300950475, 434807960/,	SYM08540	
	DATA IAL185 / 311207385, 321660565, 323335125, 306947352, 315368983,	SYM08550	
2	321562187	, 323321856, 433070943, 296690589, 300852254, 303014880,	SYM08560
3	298857375	, 298787806, 300917663, 432841611, 300266393, 300721099, 0,	SYM08570
4	433070943	, 296690589, 300852254, 303014880, 298857375, 298787806,	SYM08580
5	300917663	, 432841604, 300037017, 300721092, 0, 433070987, 300266400,	SYM08590
6	300950475	, 458008153, 300398233, 300364946, 319137419, 443131531, 0,	SYM08600
7	433070987	, 300266400, 300950475, 0, 432841611, 300266393, 300721099,	SYM08610
8	434807960	, 311207385, 321660565, 323335125, 306947352, 315368983,	SYM08620
9	321562187	, 323335829, 330049497, 340568344, 346728779, 457877335,	SYM08630
*	334243928, 342599957, 344303947/,	SYM08640	
	DATA IAL186 / 0, 432841611, 300266393, 300721099, 434807960, 311207385,	SYM08650	
2	321660565	, 323335125, 306947352, 315368983, 321562187, 323321856,	SYM08660
3	441230360	, 298525523, 296264590, 302392459, 312845772, 321332881,	SYM08670
4	323593814	, 317465945, 307016856, 302752726, 298427281, 300360717,	SYM08680
5	306586956	, 317105678, 321431123, 319497687, 313271448, 0, 432841604,	SYM08690
6	300037017	, 300721092, 434840664, 309110169, 319563414, 325691089,	SYM08700
7	323429900	, 314942667, 304489422, 434840792, 315368983, 321595027,	SYM08710
8	323528270	, 319202700, 308683726, 0, 455910980, 323106393, 323790468,	SYM08720
9	455812568	, 313304217, 302785430, 296330065, 298263564, 306554187,	SYM08730
*	317072974, 455812440, 306979863, 300622739/,	SYM08740	
	DATA IAL187 / 298361806, 302425228, 312878670, 0, 432841611, 300266393,	SYM08750	
2	300721099	, 434742294, 306980121, 317502419, 302687383, 311174616,	SYM08760
3	317489152	, 453715416, 311207001, 298591062, 298460179, 313042384,	SYM08770
4	449357263	, 317138316, 451323148, 304489357, 434512782, 296171030,	SYM08780
5	317400472	, 451650840, 304882583, 434906006, 300561301, 302654802,	SYM08790

6 317236751,319235532,310748235,298197838,0,435168203,302363616, SYM08800  
 7 303047691,428647641,309080857,294397144,0,432841615,300295243, SYM08810  
 8 310748556,321368985,300721103,302425228,310781325,321369689, SYM08820  
 9 321234571,455911065,323321856,428647563,428647257,306624025, SYM08830  
 \* 317498509,453813387,0,430744715/  
 DATA IAL188 /430744473,306656665,306656662,306558358,323335577, SYM08850  
 2 323434457,332179086,468493963,0,430745099,321237849,298624587, SYM08860  
 3 455910937,296072793,298165067,0,428647563,428647257,306624025, SYM08870  
 4 317498509,297940505,306553796,297926656,451683147,455910348, SYM08880  
 5 430745177,430744408,317469644,321267275,430286411,0, SYM08890  
 DATA WID110 /18.,21.,21.,21.,19.,18.,21.,22.,8.,16.,21.,17.,24., SYM08900  
 2 22.,22.,21.,22.,21.,20.,16.,22.,18.,24.,20.,18.,20.,18.,21.,17., SYM08910  
 3 18.,19.,20.,22.,22.,8.,21.,18.,24.,22.,18.,22.,21.,18.,16., SYM08920  
 4 18.,20.,20.,22.,20.,19.,19.,18.,19.,18.,12.,19.,19.,8.,10.,17.,8., SYM08930  
 5,30.,19.,19.,19.,19.,13.,17.,12.,19.,16.,22.,17.,16.,17.,21.,19., SYM08940  
 6 19.,18.,16.,15.,20.,21.,11.,18.,16.,21.,18.,16.,17.,22.,18.,20., SYM08950  
 7 20.,20.,22.,18.,23.,23./ SYM08960  
 DATA WID111 /20.,22.,21.,22.,21.,20.,23.,24.,11.,15.,22.,18.,25., SYM08970  
 2 23.,22.,22.,22.,22.,20.,19.,24.,20.,24.,20.,21.,20.,20.,22.,18., SYM08980  
 3 20.,21.,20.,24.,22.,11.,22.,20.,25.,23.,22.,22.,24.,22.,21.,19., SYM08990  
 4 19.,21.,20.,23.,22.,20.,21.,19.,21.,19.,13.,19.,22.,11.,11.,21., SYM09000  
 5 11.,33.,22.,20.,21.,20.,17.,17.,15.,22.,18.,24.,20.,19.,18.,23., SYM09010  
 6 21.,20.,19.,18.,18.,22.,23.,12.,20.,20.,23.,20.,17.,18.,22.,19., SYM09020  
 7 21.,20.,20.,22.,18.,23.,23./ SYM09030  
 DATA WID112 /20.,24.,21.,23.,23.,22.,22.,26.,13.,18.,23.,20.,27., SYM09040  
 2 25.,22.,23.,22.,24.,23.,21.,25.,20.,26.,22.,21.,22.,24.,24.,19., SYM09050  
 3 20.,17.,24.,24.,25.,24.,24.,25.,24.,24.,22.,26.,34.,10.,22.,31., SYM09060  
 4 19.,14.,14.,27.,22.,21.,19.,18.,21.,18.,15.,20.,21.,13.,13.,20., SYM09070  
 5 12.,33.,23.,18.,21.,20.,17.,17.,14.,23.,20.,29.,20.,21.,20.,14., SYM09080  
 6 14.,21.,16.,16.,10.,10.,18.,24.,25.,11.,11.,11.,21.,24.,14., SYM09090  
 7 14.,8.,20.,14.,26.,22.,16./ SYM09100  
 DATA WID113 /20.,20.,20.,20.,20.,20.,20.,20.,20.,26.,26.,22., SYM09110  
 2 26.,14.,14.,16.,10.,10.,20.,20.,20.,20.,20.,20.,20.,20.,20., SYM09120  
 3 20.,26.,26.,22.,26.,14.,14.,16.,10.,10.,20.,21.,21.,21.,21.,21., SYM09130  
 4 21.,21.,21.,21.,21.,26.,26.,22.,26.,15.,15.,17.,11.,11.,21.,20., SYM09140  
 5 20.,20.,20.,20.,20.,20.,20.,20.,25.,25.,23.,25.,14.,14.,16., SYM09150  
 6 11.,11.,19.,20.,20.,21.,21.,19.,18.,21.,22.,9.,17.,21.,17.,24., SYM09160  
 7 22.,22.,20.,22.,20.,20.,17./ SYM09170  
 DATA WID114 /22.,20.,26.,20.,19.,20.,20.,20.,18.,20.,18.,14.,20., SYM09180  
 2 20.,9.,9.,19.,9.,31.,20.,19.,20.,20.,14.,17.,11.,20.,16.,24.,18., SYM09190  
 3 16.,18./ SYM09200  
 DATA IST110 /1,5,16,26,34,39,43,54,58,60,66,70,73,78,82,93,100,112 SYM09210  
 2,120,131,134,140,143,148,151,154,158,162,173,176,180,185,189,193, SYM09220  
 3 205,207,211,214,219,223,227,238,242,249,253,256,265,275,278,287, SYM09230  
 4 296,305,314,322,331,340,344,355,360,364,370,374,376,385,390,399, SYM09240  
 5 408,417,421,430,434,439,442,447,450,455,459,471,486,494,506,515, SYM09250  
 6 526,535,549,554,563,567,577,584,598,607,613,623,632,636,644,655, SYM09260  
 7 662,672/ SYM09270  
 DATA IST111 /683,690,710,726,740,749,757,775,785,790,799,809,815, SYM09280  
 2 826,834,855,868,898,918,935,942,952,958,967,975,983,990,997,1017, SYM09290  
 3 1023,1029,1038,1045,1055,1080,1085,1095,1101,1112,1120,1133,1154, SYM09300  
 4 1162,1175,1183,1190,1205,1226,1234,1252,1272,1290,1305,1319,1335, SYM09310  
 5 1350,1360,1388,1399,1406,1417,1427,1432,1450,1461,1478,1494,1509, SYM09320  
 6 1519,1535,1542,1553,1559,1568,1576,1585,1592,1611,1637,1650,1671, SYM09330  
 7 1686,1701,1716,1737,1744,1757,1767,1779,1789,1810,1825,1834,1849, SYM09340  
 8 1865,1872,1887,1905,1916,1932/ SYM09350  
 DATA IST112 /1953,1960,1978,1995,2009,2018,2026,2046,2056,2061, SYM09360  
 2 2071,2081,2087,2098,2106,2126,2138,2167,2185,2202,2209,2220,2226, SYM09370  
 3 2235,2243,2251,2258,2260,2262,2283,2289,2301,2305,2309,2320,2336, SYM09380  
 4 2360,2373,2377,2381,2384,2391,2399,2402,2406,2415,2435,2454,2473, SYM09390  
 5 2500,2522,2540,2556,2568,2587,2600,2617,2637,2651,2663,2678,2693, SYM09400  
 6 2701,2725,2742,2757,2776,2791,2803,2817,2825,2842,2855,2874,2894, SYM09410  
 7 2913,2927,2932,2937,2942,2964,2977,2983,2990,2997,3012,3027,3051, SYM09420

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8 3056,3063,3070,3086,3098,3100,3102,3104,3123,3130,3135,3154/      SYM09430
DATA IST113 /3177,3186,3189,3197,3205,3208,3217,3229,3232,3247,      SYM09440
2 3259,3262,3264,3266,3269,3275,3281,3285,3290,3293,3306,3325,3330,SYM09450
3 3351,3373,3378,3396,3419,3433,3462,3485,3488,3490,3492,3495,3505,SYM09460
4 3515,3519,3523,3526,3546,3566,3572,3592,3616,3620,3638,3660,3673,SYM09470
5 3702,3724,3727,3729,3731,3734,3744,3754,3758,3762,3765,3784,3803,SYM09480
6 3809,3825,3846,3853,3876,3904,3909,3941,3969,3976,3980,3984,3991,SYM09490
7 4003,4015,4031,4042,4050,4074,4082,4102,4121,4136,4146,4154,4176,SYM09500
8 4185,4189,4199,4208,4214,4224,4232,4252,4264,4287,4302,4323/      SYM09510
DATA IST114 /4329,4341,4347,4357,4364,4371,4379,4396,4413,4429,      SYM09520
2 4446,4464,4474,4497,4508,4519,4530,4539,4543,4562,4573,4591,4608,SYM09530
3 4625,4634,4656,4663,4674,4680,4690,4697,4704/      SYM09540
C                                              SYM09550
C ****                                         SYM09560
C                                              SYM09570
C FORTRAN V UNIVAC 1108 VERSION 3.0 AUGUST 1977      SYM09580
C PROBLEMS ETCETERA CONTACT N.WOLCOTT,NBS,301-921-3384      SYM09590
C                                              SYM09600
C ****                                         SYM09610
C                                              SYM09620
C SIMILAR TO ROUTINE SYMBOL USED IN PEN PLOTTERS      SYM09630
C INSTRUCTIONS FOR DRAWING CHARACTERS ARE IN ALFBET STORED      SYM09640
C TWO INSTRUCTIONS PER WORD. A ZERO FOR PEN POSITION INDICATES      SYM09650
C END OF A CHARACTER. INPUT TEXTUAL STRINGS MUST BE COMPOSED OF ONLY      SYM09660
C THE FORTRAN CHARACTERS A-Z 0-9+/-=()*,.,$ AND THE NON-FORTRAN      SYM09670
C SPECIAL CHARACTERS WHICH ARE DESCRIBED BELOW.      SYM09680
C X,Y      = (X,Y) COORDINATE OF LOWER LEFT HAND CORNER OF TEXT      SYM09690
C HEIGHT   = HEIGHTH (IN INCHES) OF UPPER CASE CHARACTERS      SYM09700
C TEXT     = INPUT TEXTUAL ARRAY OR HOLLERITH STRING      SYM09710
C THETA    = ANGLE IN DEGREES OF TEXT FROM X-AXIS      SYM09720
C N        = NUMBER OF CHARACTERS IN TEXT STRING      SYM09730
C                                              SYM09740
C IF N IS NEGATIVE AND TEXT IS A BINARY INTEGER BETWEEN      SYM09750
C 1 AND 21 A CENTERED SYMBOL FROM THE SYMBOL SET IS PRODUCED      SYM09760
C AT (X,Y).      SYM09770
C IF N IS 0 A SINGLE SIMPLEX ALPHANUMERIC FORTRAN CHARACTER      SYM09780
C (RIGHT JUSTIFIED IN TEXT) IS PRODUCED AT (X,Y).      SYM09790
C IF X AND/OR Y EQUAL 999. THE ANNOTATION WILL BE CONTINUED      SYM09800
C AFTER THE PREVIOUS X AND/OR Y TERMINATION.      SYM09810
C                                              SYM09820
C ISTART(I) CONTAINS THE INDEX INTO ALFBET OF THE FIRST INSTRUCTION      SYM09830
C OF CHARCTER NUMBER I WHOSE WIDTH IS STORED IN WIDTH(I)      SYM09840
C CHARACTERS 1 TO 26 ARE ROMAN SIMPLEX UPPER CASE      SYM09850
C CHARACTERS 27 TO 50 ARE GREEK SIMPLEX UPPER CASE      SYM09860
C CHARACTERS 51 TO 76 ARE ROMAN SIMPLEX LOWER CASE      SYM09870
C CHARACTERS 77 TO 100 ARE GREEK SIMPLEX LOWER CASE      SYM09880
C CHARACTERS 101 TO 126 ARE ROMAN COMPLEX UPPER CASE      SYM09890
C CHARACTERS 127 TO 150 ARE GREEK COMPLEX UPPER CASE      SYM09900
C CHARACTERS 151 TO 176 ARE ROMAN COMPLEX LOWER CASE      SYM09910
C CHARACTERS 177 TO 200 ARE GREEK COMPLEX LOWER CASE      SYM09920
C CHARACTERS 201 TO 226 ARE ITALIC UPPER CASE      SYM09930
C CHARACTERS 227 TO 250 ARE MATHEMATICAL AND SPECIAL SYMBOLS      SYM09940
C CHARACTERS 251 TO 276 ARE ITALIC LOWER CASE      SYM09950
C CHARACTERS 277 TO 300 ARE MATHEMATICAL AND SPECIAL SYMBOLS      SYM09960
C CHARACTERS 301 TO 320 ARE SIMPLEX DIGITS AND SPECIAL SYMBOLS      SYM09970
C CHARACTERS 321 TO 340 ARE COMPLEX DIGITS AND SPECIAL SYMBOLS      SYM09980
C CHARACTERS 341 TO 360 ARE ITALIC DIGITS AND SPECIAL SYMBOLS      SYM09990
C CHARACTERS 361 TO 380 ARE DUPLES DIGITS AND SPECIAL SYMBOLS      SYM10000
C CHARACTERS 381 TO 432 ARE DUPLEX UPPER AND LOWER CASE      SYM10010
C ISPEC(11) ARE ELEVEN SPECIAL CHARACTERS CHOSEN FROM THE NON-      SYM10020
C FORTRAN SET AT YOUR SITE. CURRENT IMPLEMENTATIONS FOLLOW      SYM10030
C SP11 MAY BE SET TO THE COMPUTER STOP CODE IF ONE EXISTS.      SYM10040
C SP1 \      NEXT CHARACTER SUBSCRIPT      SYM10050

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C   SP2    "      NEXT CHARACTER SUPERSCRIPT          SYM10060
C   SP3    @      TURN ON UPPER CASE                SYM10070
C   SP4    #      TURN ON LOWER CASE                SYM10080
C   SP5    &     TURN ON COMPLEX LETTERS             SYM10090
C   SP6    ^      NEXT CHARACTER GREEK LETTER OR MATH SYMBOL SYM10100
C   SP7    %      TURN ON SIMPLEX LETTERS             SYM10110
C   SP8    ?      BACK SPACE LAST CHARACTER          SYM10120
C   SP9    !      ITALIC LETTERS                   SYM10130
C   SP10   ;     DUPLEX LETTERS                  SYM10140
C   SP11   :     TERMINATE SCAN                 SYM10150
C
C   ****SYM10160
C   *****SYM10170
C   *****SYM10180
C
C   DIMENSION TEXT(1)                         SYM10190
C   EQUIVALENCE(ALFBET,IALEFBE)              SYM10200
C   DIMENSION ALFBET(4711)                    SYM10210
C   INTEGER STRIN,CHAR,TEXT,ALFBET,ISTART    SYM10220
C   EQUIVALENCE (IB(1),IFORT(1)), (IB(48),ISPEC(1)) SYM10230
C   RX=CX-SY                                SYM10240
C   RY=SX+CY                                SYM10250
C   RX(X,Y)=RY(-Y,X)                         SYM10260
C   RY(X,Y)=RX(Y,-X)                         SYM10270
C
C   IFLD GETS N BITS STARTING AT NSTART TH BIT FROM RIGHT SYM10280
C   IFLD(NSTART,NBITS,IWORD)=MOD(IWORD/(2**((NSTART-NBITS)),2**NBITS)+(SYM10290
C   2(1-ISIGN(1,+IWORD))/2)*(2**NBITS-1))           SYM10300
C
C   ***USE ABOVE CARD IF YOUR MACHINE HAS ONES COMPLEMENT ARITHMETIC SYM10310
C   2 (1-ISIGN(1,IWORD))/2)*(2**NBITS-MINO(1,           SYM10320
C   XMOD(-IWORD,2**((NSTART-NBITS))))           SYM10330
C
C   ***USE ABOVE CARD IF YOUR MACHINE HAS TWOS COMPLEMENT ARITHMETIC SYM10340
C   CHAR(J) GETS THE J TH CHARACTER OF NCHAR BITS FROM A STRING SYM10350
C   COMPOSED OF WORDS NWORD BITS LONG.            SYM10360
C
C   DEFINE STRIN(I,TEXT)=TEXT(I)                 SYM10370
C
C   CHAR(J)=IFLD((NWORD-MOD((J-1),NCWD)*NCHAR),NCHAR,STRIN((J+NCWD-1)/SYM10380
C   2NCWD,TEXT))                                SYM10390
C   R(XX,YY)=CO*XX-SI*YY                         SYM10400
5    IF (.NOT.FIRST) GO TO 20                  SYM10410
C   NCWD=NWORD/NCHAR                            SYM10420
C   DO 10 I=1,58                                SYM10430
C   LL=IFLD(NWORD,NCHAR,IB(I))                 SYM10440
C   IA(LL+1)=I                                 SYM10450
10   CONTINUE                                  SYM10460
20   FIRST=.FALSE.                            SYM10470
C   THE=THETA*355./(180.*113.)                 SYM10480
C   SI=SIN(THE)                               SYM10490
C   CO=COS(THE)                               SYM10500
C   SCALE=HEIGHT/21.                           SYM10510
C
C   OFFSET OF 11 UNITS                         SYM10520
C   X1=X                                     SYM10530
C   Y1=Y                                     SYM10540
C   IF (X1.GT.998.5) X1=OLDX(6)               SYM10550
C   IF (Y1.GT.998.5) Y1=OLDY(6)               SYM10560
C   NN=N                                     SYM10570
C   IF (NN) 50,30,120                         SYM10580
30   ICHR=NCWD-1                            SYM10590
C   IG=CHAR(ICHRS+1)                         SYM10600
C   IC=IA(IG+1)                             SYM10610
C   IF (IC.LE.47) GO TO 40                  SYM10620
C   WRITE(IOUT,40) IG                      SYM10630
C   GO TO 440                                SYM10640
40   NN=1                                    SYM10650
C   GO TO 140                                SYM10660
50   IF (N.EQ.-1) GO TO 60                  SYM10670
C   CALL PLOT (X1,Y1,2)                      SYM10680

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60      IG=TEXT(1)+1                               SYM10690
      IF (IG.LE.22) GO TO 70                      SYM10700
C      WRITE(IOUT,41) IG                          SYM10710
      GO TO 440                                     SYM10720
70      I6=JSTS(IG)                                SYM10730
      I5=30                                         SYM10740
80      I8=IFLD(I5,3,ISYMB0(I6))                  SYM10750
C      GO TO CENTER OF SYMBOL                   SYM10760
      IF (I8) 100,90,100                           SYM10770
90      CALL PLOT (X1,Y1,3)                        SYM10780
      X1=X1+20.                                    SYM10790
      Y1=Y1+20.                                    SYM10800
      GO TO 440                                     SYM10810
100     IX=IFLD(I5-3,6,ISYMB0(I6))                SYM10820
      IY=IFLD(I5-9,6,ISYMB0(I6))                  SYM10830
      XI=SCALE*(FLOAT(IX-32))                     SYM10840
      YI=SCALE*(FLOAT(IY-32))                     SYM10850
      CALL PLOT (X1+R(XI,YI),Y1+R(YI,-XI),I8)    SYM10860
      I5=45-I5                                      SYM10870
      IF (I5.EQ.30) I6=I6+1                         SYM10880
      GO TO 80                                       SYM10890
120     DO 130 I=1,6                             SYM10900
      OLDX(I)=X                                     SYM10910
130     OLDY(I)=Y                                 SYM10920
      ICHR=0                                         SYM10930
C          CHARACTER
140     IC=0                                         SYM10940
C          SIMPLEX CAPITAL LETTERS
      IP=0                                         SYM10950
      ICAP=0                                        SYM10960
      ICOMP=0                                       SYM10970
      ITALIC=0                                       SYM10980
      IDUPLE=0                                       SYM10990
C          NOT GREEK LETTERS
      IGREEK=0                                      SYM11000
C          PRINT SYMBOL ON LINE (NOT SUBSCRIPT OR SUPERSCRIPT)
      L=1                                           SYM11010
      SCALE=HEIGHT/21.                            SYM11020
      DO 430 I1=1,NN                            SYM11030
C          EXTRACT CHARACTER FROM TEXT
      ICHR=ICHR+1                                  SYM11040
      IG=CHAR(ICHR)                                SYM11050
      IC=IA(IC+1)                                   SYM11060
      IF (ICHR.GT.NN.AND.N.GT.0) GO TO 450        SYM11070
      IF (IC.LE.58) GO TO 160                      SYM11080
      WRITE (IOUT,150) IG                          SYM11090
150     FORMAT (1X,19HILLEGAL INPUT CHAR ,I12)    SYM11100
      GO TO 430                                     SYM11110
160     IP=ICOMP+ICAP+ITALIC+IDUPLE              SYM11120
      IF (IC-27) 170,410,270                      SYM11130
C          NUMBER OF SYMBOL
      IC=IC+IP+IGREEK-ICAP*IDUPLE*24/(50*380)   SYM11140
180     I6=ISTART(IC)                            SYM11150
      I5=30                                         SYM11160
      IF (LNGTH) GO TO 250                        SYM11170
C          PRINT ALPHBETICAL CHARACTER
190     I8=IFLD(I5,3,ALFBET(I6))                  SYM11180
C          TEST FOR END OF CHARACTER, I8=0
      IF (I8.EQ.0) GO TO 240                      SYM11190
      IX=IFLD(I5-3,6,ALFBET(I6))                  SYM11200
      IY=IFLD(I5-9,6,ALFBET(I6))                  SYM11210
C          IF L=1, PRINT SYMBOL ON LINE, IF L=2, SUBSCRIPT, IF L=3, SUPERSCRIPT
      IF L=1, PRINT SYMBOL ON LINE, IF L=2, SUBSCRIPT, IF L=3, SUPERSCRIPT
      GO TO (200,210,220), L                      SYM11220

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200	RSCALE=SCALE	SYM11320
	YOFF=0.	SYM11330
	GO TO 230	SYM11340
C	SUBSCRIPT	SYM11350
210	RSCALE=SCALE*0.5	SYM11360
	YOFF=-HEIGHT/4.	SYM11370
	GO TO 230	SYM11380
C	SUPERSCRIPT	SYM11390
220	RSCALE=SCALE*0.5	SYM11400
	YOFF=HEIGHT*3./4.	SYM11410
C	ABOVE FACTORS NEEDED TO CORRECT OFFSET FOR DIFFERENT SIZE LETTERS	SYM11420
230	YI=FLOAT(IY-11)*RSCALE+YOFF	SYM11430
	XI=FLOAT(IX-10)*RSCALE	SYM11440
	CALL PLOT (X1+R(XI,YI),Y1+R(YI,-XI),I8)	SYM11450
	I5=45-I5	SYM11460
	IF (I5.EQ.30) I6=I6+1	SYM11470
	GO TO 190	SYM11480
240	IGREEK=0	SYM11490
250	X1=X1+R(WIDTH(IC)*RSCALE,0.0)	SYM11500
	Y1=Y1+R(0.,-WIDTH(IC)*RSCALE)	SYM11510
	DO 260 I=1,5	SYM11520
	OLDX(I)=OLDX(I+1)	SYM11530
260	OLDY(I)=OLDY(I+1)	SYM11540
	OLDX(6)=X1	SYM11550
	OLDY(6)=Y1	SYM11560
	RSCALE=SCALE	SYM11570
	L=1	SYM11580
	GO TO 430	SYM11590
270	IF (IC.GT.47) GO TO 280	SYM11600
	IC=IC+273	SYM11610
	IF (ICOMP.NE.0) IC=IC+20	SYM11620
	IF (ITALIC.NE.0) IC=IC+40	SYM11630
	IF (IDUPLE.NE.0) IC=IC+60	SYM11640
	GO TO 180	SYM11650
280	L1=IC-47	SYM11660
	GO TO (290,300,310,320,330, 340,350,360,380,390, 400), L1	SYM11670
C	SUBSCRIPT	SYM11680
290	L=2	SYM11690
	GO TO 430	SYM11700
C	SUPERSCRIPT	SYM11710
300	L=3	SYM11720
	GO TO 430	SYM11730
C	UPPER CASE	SYM11740
310	ICAP=0	SYM11750
	GO TO 430	SYM11760
C	LOWER CASE	SYM11770
320	ICAP=50	SYM11780
	GO TO 430	SYM11790
C	COMPLEX LETTERS	SYM11800
330	ICOMP=100	SYM11810
	ITALIC=0	SYM11820
	IDUPLE=0	SYM11830
	GO TO 430	SYM11840
C	GREEK LETTERS	SYM11850
340	IGREEK=26	SYM11860
	IF (IDUPLE.NE.0) IGREEK=0	SYM11870
	GO TO 430	SYM11880
C	SIMPLEX LETTERS	SYM11890
350	ICOMP=0	SYM11900
	ITALIC=0	SYM11910
	IDUPLE=0	SYM11920
	GO TO 430	SYM11930
C	BACKSPACE	SYM11940

360	DO 370 I=1,5	SYM11950
	IK=6-I	SYM11960
	OLDX(IK+1)=OLDX(IK)	SYM11970
370	OLDY(IK+1)=OLDY(IK)	SYM11980
	X1=OLDX(6)	SYM11990
	Y1=OLDY(6)	SYM12000
	GO TO 430	SYM12010
C	ITALIC	
380	ITALIC=200	SYM12020
	ICOMP=0	SYM12030
	IDUPLEX=0	SYM12040
	GO TO 430	SYM12050
C	DUPLEX	
390	IDUPLEX=380	SYM12060
	ICOMP=0	SYM12070
	ITALIC=0	SYM12080
	GO TO 430	SYM12090
C	END OF SCAN	
400	GO TO 450	SYM12100
C	BLANK SPACE	
410	X1=X1+R(20.*RSCALE,0.)	SYM12110
	Y1=Y1+R(0.,-20.*RSCALE)	SYM12120
	DO 420 I=1,5	SYM12130
	OLDX(I)=OLDX(I+1)	SYM12140
420	OLDY(I)=OLDY(I+1)	SYM12150
	OLDX(6)=X1	SYM12160
	OLDY(6)=Y1	SYM12170
	L=1	SYM12180
430	CONTINUE	SYM12190
440	CONTINUE	SYM12200
	IF(LNGTH) GO TO 450	SYM12210
	OLDX(6)=X1	SYM12220
	OLDY(6)=Y1	SYM12230
450	IF (LNGTH) XL=SQRT((X1-X)**2+(Y1-Y)**2)	SYM12240
	IF(LNGTH) GO TO LX	SYM12250
	RETURN	SYM12260
	ENTRY LENGTH(XLEN,HEIGHT,TEXT,N)	SYM12270
C	LENGTH OF TEXT RETURNED IN XLEN	
	LNGTH=.TRUE.	SYM12280
	ASSIGN 460 TO LX	SYM12290
	GO TO 5	SYM12300
460	XLEN=XL	SYM12310
	LNGTH=.FALSE.	SYM12320
	RETURN	SYM12330
	END	SYM12340
		SYM12350
		SYM12360
		SYM12370
		SYM12380
		SYM12390





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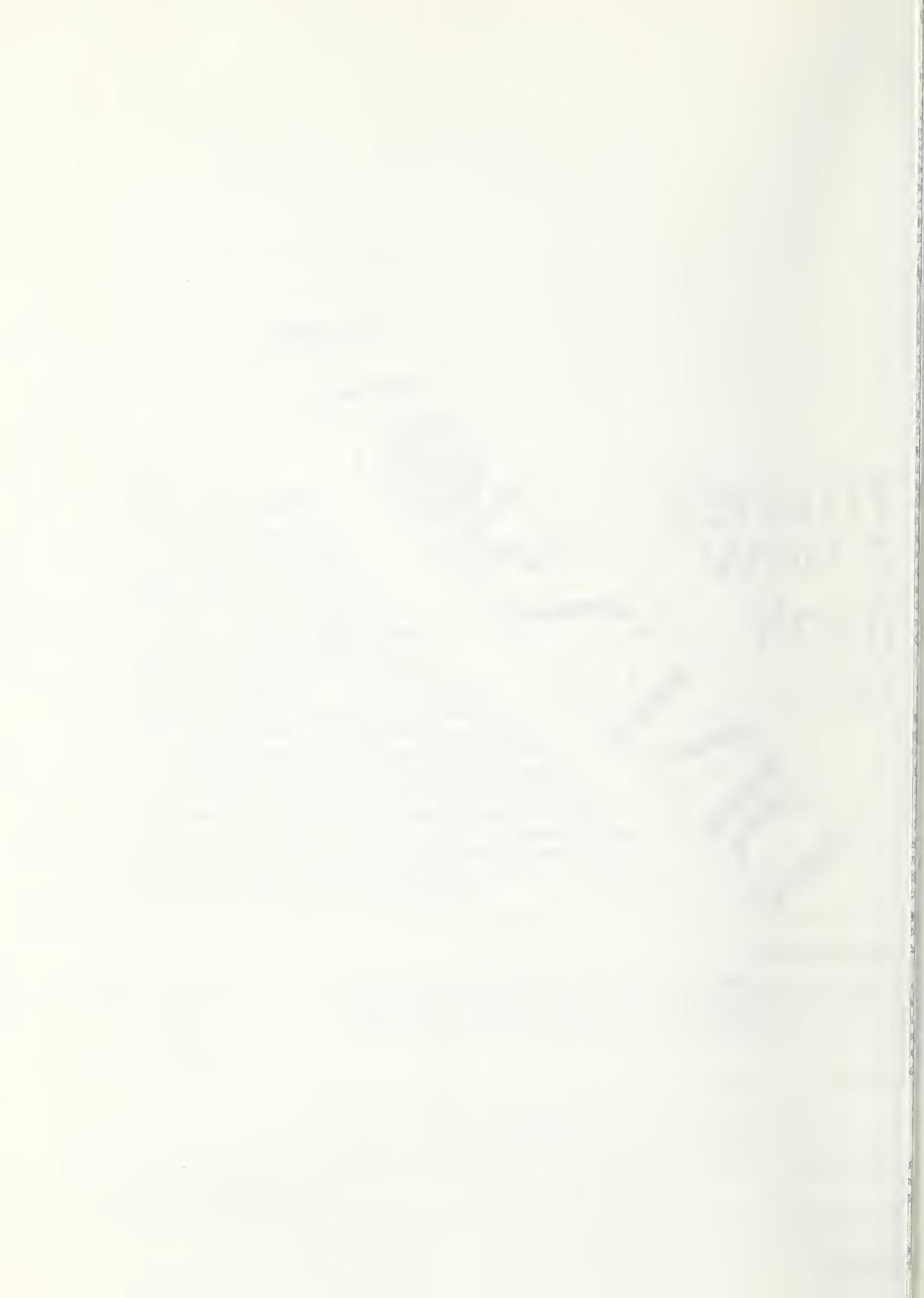
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This monthly magazine is published to inform scientists, engineers, businessmen, industry, teachers, students, and consumers of the latest advances in science and technology, with primary emphasis on the work at NBS. The magazine highlights and reviews such issues as energy research, fire protection, building technology, metric conversion, pollution abatement, health and safety, and consumer product performance. In addition, it reports the results of Bureau programs in measurement standards and techniques, properties of matter and materials, engineering standards and services, instrumentation, and automatic data processing.

Annual subscription: Domestic, \$12.50; Foreign \$15.65.

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**National Standard Reference Data Series**—Provides quantitative data on the physical and chemical properties of materials, compiled from the world's literature and critically evaluated. Developed under a world-wide program co-ordinated by NBS. Program under authority of National Standard Data Act (Public Law 90-396).

**NOTE:** At present the principal publication outlet for these data is the Journal of Physical and Chemical Reference Data (JPCRD) published quarterly for NBS by the American Chemical Society (ACS) and the American Institute of Physics (AIP). Subscriptions, reprints, and supplements available from ACS, 1155 Sixteenth St. N.W., Wash., D.C. 20056.

**Building Science Series**—Disseminates technical information developed at the Bureau on building materials, components, systems, and whole structures. The series presents research results, test methods, and performance criteria related to the structural and environmental functions and the durability and safety characteristics of building elements and systems.

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